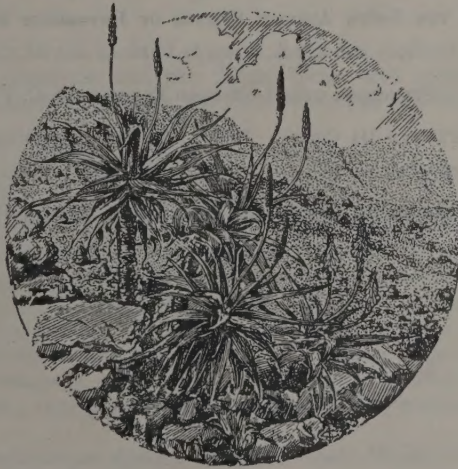


Bothalia

A RECORD OF
CONTRIBUTIONS
FROM THE
NATIONAL HERBARIUM
UNION OF SOUTH AFRICA
PRETORIA



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SOUTH AFRICAN RUST FUNGI, III.

by

E. M. Doidge.

[The first paper of this series, entitled "A Preliminary Study of the South African Rust Fungi" constituted Part Ia of Vol. 2 of *Bothalia* (1927). South African Rust Fungi II appeared in Vol. 2 Part 2 (1928)].

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***Aecidium Burt-Davyi* nov. spec.**

Aecidiis foliicolis et petiolicolis, matricem incrassatis, plerumque dense confertis, cylindraceis, usque 2 mm. longis, 300–400 μ latis, pallide flavis, primo clausis dein apertis margine erecto vix lacerato; cellulis peridie arctissime conjunctis, irregularibus, 25–42.5 \times 10–20 μ , pariete exteriori striato 8–15 μ crasso, interiore striato-verrucoso 4–5 μ crasso; sporis subglobosis, ovatis, ellipsoideis v. oblongis, saepe irregularibus et angulatis, subtilissime verruculosi, 21–43 \times 16–22.5 μ , episporio ubique 2–2.5 μ crasso, poris germinationis obscuris.

Hab. in foliis petiolisque *Acaciae stoloniferae* Burch., Christiana, leg. Burt Davy, 1973 et 5581.

This may possibly be the aecidial stage of *Ravenelia modesta* (q.v.) which occurs on the same host, but the aecidium and the teleuto-form were collected in widely separated localities and no connection between the two forms has yet been established.

***Aecidium Dinteri* nov. spec.**

Pycnidiis minutis, superficialibus, inter aecidia distributis, applanato-hemisphericis, melleo-brunneis, 50–75 μ diam.

Aecidiis ramicolis et petiolicolis, ramulos incrassatos et uncinatos plus minus contortos dense aequaliterque distributis, longe exsertis, tubulosis, 2.5–4 μ altis, 250–300 μ latis, pallide flavo-brunneis, diu clausis, tandem apertis, margine pallidiore, leniter recurvato, denticulato; cellulis peridie arctissime conjunctis, quoad formam valde variabilis, saepe rectangularibus v. irregulariter rhomboideis, 25–43 \times 15–20 μ , pariete exteriori striato, 12–15 μ crasso, interiore striato-verrucosa 3.5–5 μ crasso. Sporis irregularibus plerumque angulato-globosis oblongis v. ellipsoideis, 25–32.5 \times 17.5–22.5 μ , dense minuteque verruculosi, subhyalinis; episporio 2.5–3 μ crasso, poris germinationis sparsis (usque 8) praedito.

Hab. in ramis petiolisque *Acaciae uncinatae* Engl., Otjihavera–Okapuka, S.W. Africa, leg. Dinter 3488 (ex. Herb. Marloth) 26686.

***Aecidium litakunensis* nov. spec.**

Pycnidiis inter aecidiis sparsis, melleis, applanato-hemisphericis, 60–100 μ diam.

Aecidiis foliicolis et ramicolis; in foliis petiolisque gallas subglobosas usque oblongas, plus minus flexuosas et distortas, magnitudine variables, 2–4 cm. longas, 5–15 mm. crassas formantibus, dense confertis, cylindraceis, usque 1.5 mm. longis, 350–500 μ latis, flavidis v. flavo-brunneis, diu clausis; cellulis peridie irregularibus, 20–37.5 \times 7.5–17.5 μ , pariete exteriori striato 12–15 μ crasso, interiore striato-verrucoso 3–5 μ crasso. Sporis globosis, ovatis, ellipsoideis v. oblongis, saepe irregularibus et angulatis, verruculosi, pallide flavidis v. subhyalinis, 22–30 \times 17–22 μ , episporio ubique 1.5–2 μ crasso, poris germinationis obscuris.

Hab. in foliis *Acaciae litakunensis* Burch., inter Rustenburg et Northam, leg. Scott, 27294; Bechuanaland leg. Burt Davy, 2443.

Aecidium Moggii nov. spec.

Pycnidiis amphigenis sed plerumque epiphyllis, copiose evolutis, inter aecidia distributis vel per magnam folii partem aequaliter dispositis, ex flavidis tandem nigrescentibus, 90–130 μ diam.

Aecidiis hypophyllis, singulis subinde epiphyllis, plerumque per totam folii superficiem dense aequaliterque distributis, cupulatis, 200–250 μ diam., margine laciniato; cellulis peridie fere quadraticis usque rhomboideis, 20–35 \times 10–20 μ , pariete exteriori striato 5–6 μ crasso, interiore verrucoso 3–5 μ crasso. Sporis angulato-globosis, oblongis v. late ellipsoideis, minutissime verruculosus, subhyalinis, 17–22.5 \times 15–20 μ , episporio 1.5–2 μ crasso.

Hab. in foliis *Senecionis coronati* Harv., Pretoria, leg. Mogg, 23636.

Aecidium tetragoniae nov. spec.

Pycnidiis amphigenis, inter aecidia copiose sparsis, melleis dein atro-brunneis, 120–180 μ diam.

Aecidiis amphigenis, totam folii superficiem vel magnam ejus partem dense aequaliterque obtegentibus, diu hemispherico-clausis, tandem apertis cupulatis, 300–400 μ diam., margine albo laciniato mox evanescente; cellulis peridie laxae conjunctis, irregularibus, 27–42 \times 15–25 μ , pariete exteriori striato 5–8 μ crasso, interiore verrucoso 2–3 μ crasso. Sporis sub-globosis, oblongis, ellipsoideis vel ovatis, plerumque angulatis, 20–32.5 \times 15–20 μ ; episporio 2.5–5 μ crasso, dense minuteque verruculoso.

Hab. in foliis *Tetragoniae arbusculae* Fenzl., Fauresmith, leg. Henrici, 25892.

Masseëlla fueggeae Syd.

in Ann. Myc. 26 (1928) 424.

Syn. *Uredo brideiae* (P. Henn. et Evans) Doidge in Bothalia 2 (1927) 193.

Aecidium brideiae P. Henn. et Evans in Engl. Bot. Jahrb. 41 (1908) 272;
Syd. Monogr. Ured. 4 (1924) 186.

Uredo-sori hypophyllous, on small leaf spots which may be indistinct, or yellow to yellow-brown, irregularly scattered or in groups of 2–8, long covered by the discoloured, yellow-brown epidermis, very minute, 200–350 μ diam. Uredospores subglobose, ovate or ellipsoid, borne singly, 17–26 \times 14–20 μ ; episporium hyaline, 1.5–2 μ thick, minutely verruculose-echinulate, germ pores obscure.

Teleuto-sori epiphyllous—very rarely a single one occurs on the under side of the leaf—deeply immersed, in small or larger groups, or even solitary, minute; the spores protrude from the sori in filiform columns 1–2.5 mm. long and 50–90 μ broad, these are usually curved and become dark brown when dry. Teleutospores ovate or ellipsoid, often slightly angular, 1-celled, smooth, deep yellow or golden yellow, embedded in a mucous mass, 22–30 \times 15–21 μ ; episporium about 3 μ thick with a distinct apical germ pore.

Hab. on leaves of *Fluggea virosa* (Roxb.) Baill. (= *Fluggea microcarpa* Blume) near Nelspruit, Burt Davy, 77; Nelspruit, Liebenberg, 25968; Schagen, Liebenberg, 26359.

In Bothalia (loc. cit.) it was pointed out that number 77 was a *uredo*-form; more recently the *teleuto*-stage has been collected by Liebenberg, and it agrees in every detail with the fungus described by Sydow on *Fluggea virosa* from the Philippines.

Puccinia byliantum Dippenaar.

in the South African Journ. Sci. 28 (1931) 288.

Syn. *Aecidium byliantum* Syd. in Ann. Myc. 22 (1924) 236; Bothalia 2 (1927) 172.

Aecidia hypophyllous or caulicolous, developing on thickened and sometimes distorted parts of the host plant, sub-seriate or in densely crowded, elongated groups 1–2 cm. long (fide Sydow, amphigenous, chiefly hypophyllous, on yellow leaf spots, closely crowded in

groups 3–8 mm. diam.) immersed, cupulate, 250–300 μ diam., margin erect, white, lacerate. Cells of the peridium firmly compacted, rhomboid, $20\text{--}30 \times 10\text{--}16 \mu$; outer wall striate, 6–10 μ thick, inner verrucose 3–5 μ thick. Spores angular-globose, subhyaline, 10–18 μ diam., episore very delicately verruculose, about 1 μ thick.

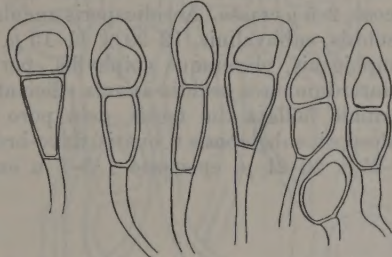


Fig. 1.—*Puccinia byliianum*, teleutospores.

Teleuto-sori cauliculous, rarely on the leaves, scattered or in groups, often developing between the aecidia, long covered by the raised epidermis, which finally splits longitudinally, oblong, about $\frac{1}{2}$ mm. long, sometimes becoming confluent and up to 4 mm. long, black. Teleuto-spores oblong, ellipsoid or subclavate, $35\text{--}52.5 \times 12.5\text{--}22.5 \mu$, light brown, darker at the apex; apex rounded, truncate or obtusely acuminate, often oblique, attenuate at the base, constricted at the septum; episore smooth, 1.5–2 μ thick, thickened at the apex up to 8 μ ; pedicel persistent, up to 42 μ long, subhyaline or light brown, 5–6 μ thick. Mesospores fairly numerous, ellipsoid to subclavate, $25\text{--}33 \times 15\text{--}17.5 \mu$; episore similar to that of the teleutospores. An occasional 3-septate spore was seen.

Hab. on leaves and stems of *Senecio Burchellii* DC., Bloemfontein, Potts, 24875 (Grey. Univ. Coll. No. 8017); I. Pretoria, Fuller, 15018.

In Bothalia 2 (1927) 171, the aecidial stage (No. 15018) was recorded as *Aecidium incertum* Syd. on *Senecio laevigatus* Thun. On comparison, the host of this number proves to be the closely similar species *Senecio Burchellii*, and the aecidium is identical with that of the plant on which teleuto-sori were found.

The aecidium closely resembles *Aecidium incertum* Syd., which was first described on *Senecio napifolius*; no teleutospores have yet been found on the latter host, so that it is impossible to say whether *Aecidium incertum* Syd. is a synonym for *Puccinia byliianum*.

Although the teleutospores of the Orange Free State specimen are somewhat smaller, there can be no doubt that this is the rust found in the winter rainfall area, and described by Dippenaar as occurring on *Senecio* spp., *Senecio littoreus*, *S. pinnulatus*, *S. vulgaris* and *S. bipinnatifida* from Ceres, Hopefield, Knysna and Stellenbosch.

This species differs widely from *Puccinia pentactina* described as occurring on *Senecio pentactinus* [Bothalia 2 (1928) 473].

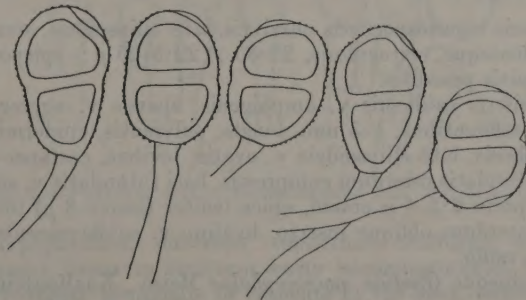


Fig. 2.—*Puccinia pentactina*, teleutospores.

✓ ***Puccinia Liebenbergii* nov. spec.**

Aecidiis hypophyllis, maculis brunneolis 1–2 mm. diam. insidentibus, 3–7 in centro macularum aggregatis, cupulatis, 200–250 μ diam., margine albido reflexo laciniato; cellulis peridie laxiuscule conjunctis, rhomboideis, 20–25 \times 15–18 μ , pariete exteriori striato, 2–4 μ crasso, interiore verrucoso, 2–5 μ crasso. *Aecidiosporis* angulato-globosis v. ellipsoideis, dense et subtilissime verruculosi, subhyalinis, 12–20 \times 11–15 μ , episporio 1 μ crasso.

Soris uredosporiferis amphigenis, plerumque epiphyllis, per totam folii superficiem plus minusve dense sparsis, interdum circa aecidia annula efficientibus, minutis, rotundatis, usque $\frac{1}{2}$ mm. diam., epidermide bullata diu tectis, dein poro rotundo centrali apertis, cinnamomeo-brunneis. Uredosporis subglobosis v. ovatis, flavo-brunneolis, ubique aequaliter et sat valide aculeatis, 20–25 \times 20–21 μ , episporio 1.5–2 μ crasso, poris germinationis obscuris.

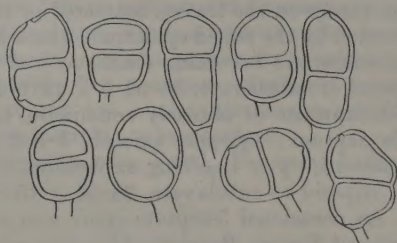


Fig. 3.—*Puccinia Liebenbergii*, teleutospores.

Soris teleutosporiferis conformibus, atro-brunneis, vel teleutosporis in soris uredosporiferis immixtis. Teleutosporis ellipsoideis, sub-globosis v. irregularibus, levibus, brunneis, 27.5–40 \times 20–27.5 μ , apice plerumque rotundatis rarius applanatis, medio leniter constrictis, basi plerumque rotundatis interdum attenuatis; episporio 1.5 μ crasso, ad apicem haud incrassato; pedicello hyalino, deciduo, teleutosporam subaequante, verticale v. oblique, nonnunquam transverse inserto.

Hab. in foliis *Sonchi* sp., Schagen, leg. Liebenberg, 26176.

✓ ***Puccinia gnidiae* nov. spec.**

Uredosporis in soris teleutosporiferis immixtis, late ellipsoideis, ovatis v. subglobosis, brunneis, subtiliter denseque verruculosi, 25–30 \times 22.5–25 μ ; episporio 2.5–3 μ crasso, poris germ. ca 4–7 sparsis praeditis.

Soris teleutosporiferis cauliculis v. amphigenis, sparsis v. aggregatis, rotundatis v. ellipticis, interdum confluentibus, $\frac{1}{2}$ –3 mm. longis, pulvinatis, epidermide lacerata cinctis. Teleutosporis sub-globosis, late ellipsoideis v. ovatis, levibus, castaneo-brunneis, 30–40 \times 25–30 μ , apice late rotundatis interdum compressis, basi rotundatis v. subattenuatis, medio vix constrictis; episporio 2.5–4 μ crasso, apice leniter (usque 8 μ) incrassato; pedicello persistente, valido, interdum oblique inserto, hyalino v. subflavescente, 7.5–10 μ crasso, lumine haud raro fere nullo.

Hab. in caulis foliisque *Gnidiae macrocephalae* Meisn., Kaalfontein, leg. Pole Evans, 10083.

The stems of the host plant showed indications of the occurrence of an aecidium earlier in the season.

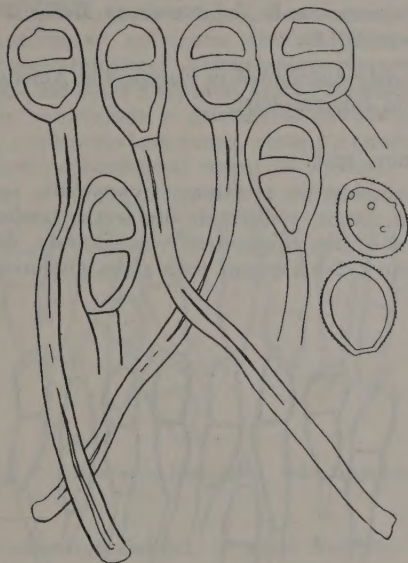


Fig. 4.—*Puccinia gnidiae*, teleutospores and uredospores.

Mesospores were occasionally seen; they were ovate, $30-33 \times 25-27.5 \mu$, with characters similar to those of the teleutospores. The upper loculus of the teleutospore is often compressed, directly (making the apex almost flat) or obliquely.

***Puccinia iridis* (DC.) Wallr.**

in Rabh. Krypt. Fl. ed. I (1844) 23; Syd. in Monogr. Ured. 1 (1904) 598.

Uredo-sori amphigenous, scattered or subgregarious, round, oblong or elongated, long covered by the epidermis, which at length splits and remains partially veiling the pulverulent sorus, up to 2 mm. long, rusty brown. Uredospores globose, subglobose, ellipsoid or ovate, ochraceous, $20-35 \times 16-26 \mu$; epispore rather coarsely echinulate, 1.5-2 mm. thick, slightly thicker (2.5μ) at the base, germ pores 2-3 equatorial, rather conspicuous, papillate.

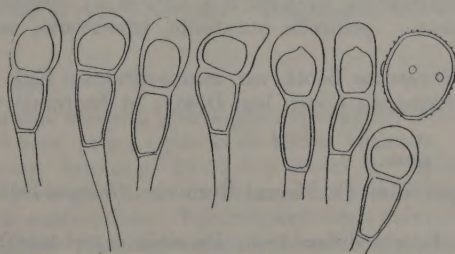


Fig. 5.—*Puccinia iridis*, teleutospores and one uredospore.

Teleuto-sori hypophyllous, scattered, sometimes confluent, sometimes developing between the uredo-sori, linear or striiform, early becoming naked, black. Teleutospores clavate or oblong, rounded, acuminate or truncate at the apex, slightly constricted at the septum, usually attenuate at the base, light golden brown, darker at the apex, $30-52 \times$

14–22 μ ; epispore smooth, delicate, about 1 μ thick in the lower loculus, up to 2 μ thick in the upper, very much thickened, up to 14 μ , at the apex; pedicel tinted brown, persistent, as long as the spore or shorter. The loculi separate readily at the septum.

Hab. on leaves of *Iris germanica* L., Johannesburg, *Hollis*, 25922, and *Iris* sp. (*regiliocyclus*) Johannesburg *Hingst* 30142.

This rust, which is widely distributed in Europe and America, has only recently made its appearance in gardens in Johannesburg.

***Puccinia caricis-cernuae* nov. spec.**

Soris uredosporiferis amphigenis, plerumque hypophyllis, sparsis v. gregariis, oblongis v. linearibus, usque 3 mm. longis, epidermide diu tectis, tandem longitudinaliter apertis, cinnamomeis; Uredosporis ovatis, ellipsoideis v. subglobosis, dilute brunneis, echinulatis, 20–25 \times 16–19 μ . episporio 2–2.5 μ crasso, poris germ. obscuris.

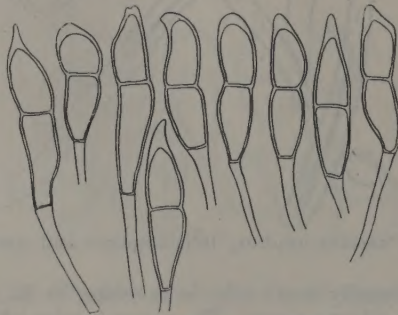


Fig. 6.—*Puccinia caricis-cernuae*, teleutospores.

Soris teleutosporiferis amphigenis, plerumque hypophyllis, maculis nullis v. indeterminatis flavis insidentibus, sparsis v. gregariis, oblongis v. linearibus, saepe in strias longas (usque 6 mm.) confluentibus, diu epidermide plumbea tectis, pulvinatis. Teleutosporis clavatis v. fusoido-clavatis, apice rotundatis v. conico-angustatis, saepe oblique productis, nonnunquam subtruncatis, medio leniter constrictis, basi attenuatis, levibus, pallide brunneolis, sursum saturatioribus, 37.5–62.5 \times 12.5–9 μ ; episporio ca. 1 μ crasso, apice leniter (2.5–9 μ) incrassato; pedicello brunneolo, persistente, usque 48 μ longo, 4–5 μ crasso.

Hab. in foliis *Caricis cernuae* Boott. var. *austro-africanae* Kuk., Pelindaba, leg. Doidge et Bottomley, 29873; Skinner's Court, leg. Doidge et Bottomley, 23444.

***Puccinia pegleriana* nov. nom.**

Syn. *Puccinia cyperi-tagetiformis* (P. Henn.) Kern var. *africana* Doidge in Bothalia 2 (1927) 116.

The South African fungus differs from *Puccinia cyperi-tagetiformis* (P. Henn.) Kern (Mycologia XI, 1919, p. 138) in several particulars; the uredospores are somewhat larger and have a much thicker wall, and the teleutospores are considerably longer. *P. cyperi-tagetiformis* is not represented in the Cryptogamic Herbarium at Pretoria and has not been compared with the South African material, but in view of the distinct differences in the descriptions of both uredo- and teleutospores, it is considered advisable to regard this as a distinct species and not as a variety.

✓ ***Puccinia Morganae* nov. spec.**

Soris teleutosporiferis hypophyllis, maculis flavidis v. brunneolis effusis saepe insidentibus, minutis, rotundatis v. ellipticis, usque 0.4 mm. diam., sparsis v. irregulariter aggregatis, interdum confertis confluentibusque, pulvinatis, diutius tectis, demum epidermide rupta cinctis v. semivelatis, ochraceo-brunneis. Teleutosporis plerumque clavatis v. oblongo-clavatis, interdum fusiformis, rarissime 2-septatis, apice rotundatis, recte v. oblique conico-attenuatis, rarius truncatis, subhyalinis v. dilutissime flavo-brunneolis, $37.5-55 \times 12.5-15 \mu$, rarius usque 17μ latis; episporio leve, tenue, usque 1μ crasso, apice leniter (usque 3μ) incrassato; pedicello subhyalino persistenti, usque 35μ longo.

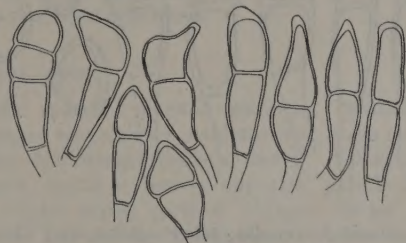


Fig. 7.—*Puccinia Morganae*, teleutospores.

Hab. in foliis *Cyperi albostriati* Schrad. in silvis Xumeni, prope Donnybrook, leg. Morgan et Doidge, 29985.

This species differs widely from *Puccinia cyperi-fastigiati* Doidge and *P. pegleriana* (Bothalia 2, 1928, p. 473; and 2, 1927, p. 117). Teleutospores of the former species are illustrated for comparison; for form of the teleutospores of *P. pegleriana* see Bothalia, loc. cit.

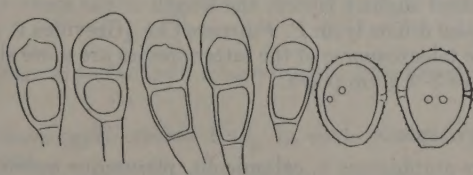


Fig. 8.—*Puccinia cyperi-fastigiati*, teleutospores and uredospores.

✓ ***Puccinia fuirenella* nov. spec.**

Soris uredosporiferis sine maculis, plerumque hypophyllis, rarius epiphyllis, linearibus, minutis, usque 1 mm. longis, primo epidermide tectis, brunneis. Uredosporis late ellipsoideis, globosis v. ovatis, brunneis, $25-32.5 \times 20-25 \mu$; episporio 2-2.5 μ crasso, remotiuscule echinulato, poris germinationis 2 conspicuis papillatis equatorialibus praeditis.

Soris teleutosporiferis conformibus. Teleutosporis longe clavatis v. lanceolatis, levibus, diluto aureo-brunneis, apice plerumque pallidioribus, rotundatis truncatis v. conicis, nonnunquam obliquis, rarissime dentibus 2 coronatis, medio leniter constrictis, deorsum in pedicellum attenuatis. $42-72.5 \times 17.5-22.5 \mu$; episporio 1-2.5 μ crasso, ad apicem valde incrassato usque 13μ ; pedicello subhyalino, usque 40μ longo, apice 8-10 μ crasso, deorsum attenuatis.

Hab. in foliis vaginisque *Fuirenae pubescentis* (Lam.) Kunth., Donkerpoort, leg. Doidge et Bottomley, 29977.

The uredo-form also occurs on :—

Fuirena coerulescens Steud., Maritzburg, *Pole Evans*, 1444.

Fuirena pubescens (Lam.) Kunth, Nelspruit, *Liebenberg*, 26074.

Fuirena chlorocarpa Ridley, Xumeni Forest, Donnybrook, *Morgan and Doidge*, 29823; Donkerpoort, *Doidge and Bottomley*, 29983.

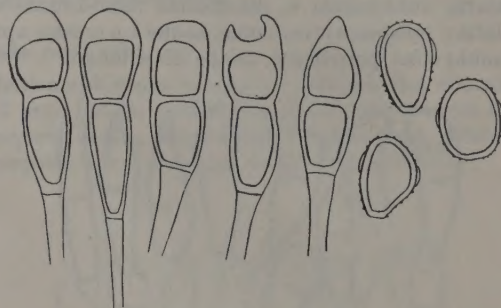


Fig. 9.—*Puccinia fuirenella*, teleutospores and uredospores.

The uredo on *F. coerulescens* was recorded under the name *Uredo Fuirenae* P. Henn. in *Bothalia* 2 (1927), p. 198. *Uredo Fuirenae* P. Henn. was originally described on *Fuirena umbellata* from Brazil, and has been shown by Kern, Ciferri and Thurston in *Ann. Myc.* 31 (1933), p. 13, to be the uredo-form of *Puccinia fuirenicola* Arth. A portion of the type collection (*Mycoflora Domingensis exsiccata* 117) of this rust has been examined; the uredospores resemble those of *Puccinia fuirenella*, but the teleutospores differ in several particulars from those of the South African rust. The original description reads "teliospores cylindric or ellipsoid, constricted at septum, rounded or somewhat pointed above and usually narrowed below; wall cinnamon brown, $1.5-2\ \mu$; upper cell usually darker and thickened at the apex, $4-7\ \mu$; pedicel slightly tinted, the length of the spore or less".

Puccinia fuirenella also differs from *P. Fuirenae* Cke. [*Grevillea* 6, p. 137; *Syd. Monogr. Ured.* 1 (1904) 687]; the teleutospores of the latter species are more slender, $11-15\ \mu$ broad, and the uredo-spores have 3-4 germ pores.

Puccinia kyllingicola nov. spec.

Soris uredosporiferis amphigenis v. calamicolis, plerumque autem hypophyllis, maculis conspicuis rufo-brunneis insidentibus, sparsis v. paucis aggregatis, nonnumquam circulariter circa solum centralem dispositis, ellipticis v. oblongis, $\frac{1}{2}$ to 1 mm. longis, epidermide inflata diu tectis. Uredosporis ovatis, ellipsoideis, subglobosis, subinde angulatis, diu hyalinis v. subhyalinis, tandem flavis v. flavo-brunneolis, $22-32.5 \times 15-20\ \mu$; episporio $1.5-2\ \mu$ crasso, breviter laxiusculeque echinulato, poris germ. 2, rarius 3-4, equatorialibus praedito.

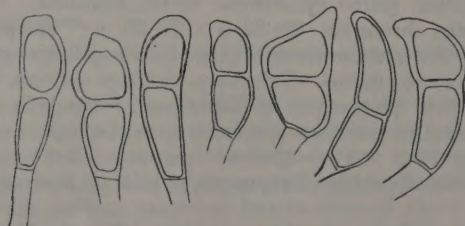


Fig. 10.—*Puccinia kyllingicola*, teleutospores.

Soris teleutosporiferis minutis, compactis, epidermide tectis. Teleutosporis oblongis v. clavatis, rectis v. curvatis, levibus, aureo-brunneis, apice rotundatis, truncatis v. attenuatis, interdum obliquis, medio leniter constrictis, basi saepius attenuatis, $40-77 \times 15-25 \mu$ plerumque $15-20 \mu$ latis; episporio ca. 1.5μ crasso apice incrassato usque 10μ ; pedicello subpersistente, brunneolo, usque 25μ longo.

Hab. in foliis calamisque *Kyllingae melanospermae* Nees, Donkerpoort, leg. Doidge et Bottomley, 29971; II. Karino, leg. Wager, 23414.

This rust differs from *Puccinia mysorensis* Syd. et Butler [Ann. Myc. 4 (1906), p. 434], in the size of the teleutospores, which are larger and thicker at the apex. The uredo resembles *Uredo Kyllingiae* P. Henn., but so far as can be ascertained the teleuto-stage of this American species has not been described.

***Puccinia schoenoxypii* nov. spec.**

Soris teleutosporiferis sparsis, maculis minutis, brunneis, conspicuis, plerumque ellipticis, usque 2 mm. longis, singulariter insidentibus; soris minutis, ellipticis, $\frac{1}{2}$ to $\frac{3}{4}$ mm longis, fusco-brunneis, diu epidermide bullata tectis. Teleutosporis plerumque clavatis, rarius fusoides v. oblongis, rectis v. leniter curvatis, pallide luteo-auranteis, ad apicem obscurioribus, apice rotundatis rarius recte v. oblique obtuse conicis, medio plus minus constrictis, basi plerumque attenuatis, nonnunquam subrotundatis, $40-58 \times 14-20 \mu$; episporio leve, tenue, $1-1.5 \mu$ crasso, ad apicem valde incrassato, $7.5-12.5 \mu$, interdum usque 15.5μ ; pedicello persistente, leniter brunneolo, 5μ crasso et usque 50μ longo.

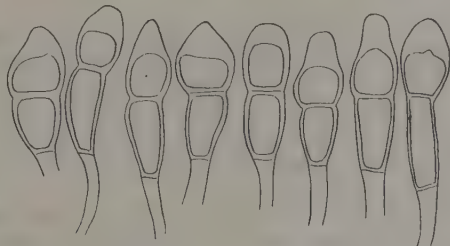


Fig. 11.—*Puccinia schoenoxypii*, teleutospores.

Hab. in foliis *Schoenoxypii spartii* Kuk., in silvis Xumeni, prope Donnybrook, leg. Morgan et Doidge, 30106.

***Puccinia scleriae-dregeanae* nov. spec.**

Soris uredosporiferis amphigenis, plerumque hypophyllis, maculis minutis, conspicuis, elongatis, usque 1 mm. longis, sparsis insidentibus, singulis v. paucis in quoque macula, ellipticis v. linearibus, cinnamomeis, usque 400μ longis, diu epidermide bullata tectis. Uredosporis ellipsoideis, ovatis v. subglobosis, $20-30 \times 15-20 \mu$; episporio fere hyalino, $1-1.5 \mu$ crasso, remote subtiliterque echinato, poris germ. obscuris, ut videtur 3, equatorialibus.

Soris teleutosporiferis inter soros uredosporiferos sparsis, hypophyllis, minutis, $150-200 \mu$ longis, ellipticis, atro-brunneis, epidermide tectis, compactis. Teleutosporis plerumque clavatis, rarius cylindraceutis v. fusoides, $30-45 \times 10-22.5 \mu$, cellula superiore pallide auranteo-brunnea usque cinnamomea, inferiore pallidiore, apice rotundatis, truncatis v. plerumque oblique acuminatis v. melius in rostrum productis, medio non vel vix constrictis, basi plerumque pedicellum versus attenuatis, interdum subrotundatis; episporio leve, tenue, $1-1.5 \mu$ crasso, ad apicem leniter incrassato $3.5-8 \mu$; pedicello persistente, pallide flavo-brunneolo, $5-6 \mu$ crasso et usque 23μ longo.

Hab. in foliis *Scleriae Dregeanae* Kunth, Donkerpoort, leg. Doidge et Bottonley, 29982.



Fig. 12.—*Puccinia scleriae-dregeanae*, teleutospores.

The loculi separate readily at the septum and fall apart. This rust differs widely from *Rostrupia scleriae* Pazschke in the size of the teleutospores and sori, and in the absence of 2-septate spores. It approaches more nearly to *Puccinia sclericola* Arthur, but there has been no opportunity of examining this species. The description differs in several details (Mycologia 7, 1915, p. 232) particularly in the almost hyaline uredospores.

***Puccinia amphiphididis* nov. spec.**

Soris uredosporiferis hypophyllis, maculis brunneolis indeterminatis insidentibus, minutis, usque $\frac{3}{4}$ mm. longis, oblongis, sparsis v. gregariis, mox nudis, epidermide lacerata cinctis, cinnamomeis. Uredosporis plerumque ovatis, rarius ellipsoideis v. subglobosis, echinulatis, brunneis, $25-35 \times 17.5-20 \mu$; episporio $1.5-2.5 \mu$ crasso, ad apicem nonnuncquam leniter incrassato usque 4μ , poris germinationis 4-6 equatorialibus praedito. Paraphysibus numerosis, capitatis v. clavatis, flavo-brunneolis, rarius hyalinis, rectis v. leniter curvatis, $45-85 \mu$ longis, ad apicem $12.5-20 \mu$ latis, membrana ca $2-2.5$ crassa, ad apicem usque 7.5μ incrassata, lumine haud raro fere nullo.

Soris teleutosporiferis consimilis, atro-brunneis. Teleutosporis subglobosis v. oblongo-ellipsoideis, levibus, castaneo-brunneis, $30-40 \times 22-25 \mu$, apice late rotundatis, basi rotundatis v. subattenuatis, medio vix constrictis: episporio $2.5-3 \mu$ crasso, apice leniter incrassato, usque 6.5μ : pedicello persistente, crassiusculo, apice $5-7.5 \mu$ crasso, usque 115μ longo, ubique brunneolo, interdum oblique, rarius lateraliter inserto.

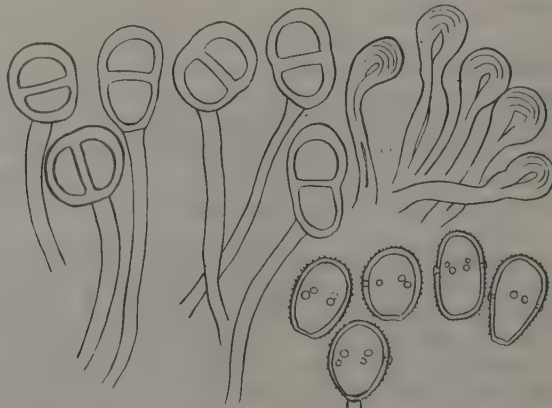


Fig. 13.—*Puccinia amphiphididis*, teleutospores, paraphyses and uredospores.

Hab. in foliis *Amphilophidis insculptae* Stapf., Schagen, leg. Liebenberg, 26024; II. Godwan River. leg. Liebenberg, 26056; Nelspruit leg. Liebenberg, 26029; Warmbaths, leg. Curson, 26394.

This rust resembles *Puccinia versicolor* and *P. erythraeënsis*, which also occur on *Andropogoneae*, in the form of its teleutospores, but differs in having brown pedicels. The uredospores differ from those of either of the two species mentioned in having 4-6, fairly conspicuous, sub-papillate, equatorial germ pores.

***Puccinia eucomis* nov. spec.**

Soris uredosporiferis amphigenis, dense seriatim dispositis, oblongis, $\frac{1}{2}$ -1 mm. longis saepe autem conflundo longioribus, aurantiacis, mox nudis, pulverulentis, epidermide fissis cinctis. Uredosporis plerumque ovatis, rarius subglobosis v. oblongis, $25-35\ \mu \times 18-22\cdot5\ \mu$; episporio subhyalino, subtiliter verruculoso, $2-2\cdot5\ \mu$ crasso, ad apicem incrassato $6-7\cdot5\ \mu$, rarius usque $9\ \mu$; poris germinationis obscuris; paraphysibus nullis.

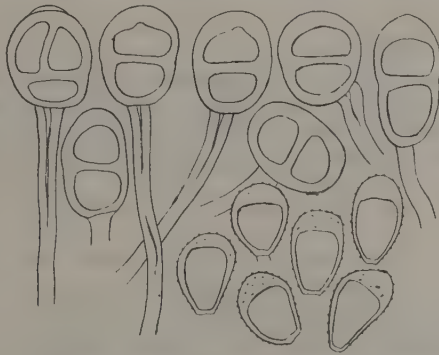


Fig. 14.--*Puccinia eucomis*, teleutospores and uredospores.

Soris teleutosporiferis conformibus, atro-brunneis, subpulvinatis. Teleutosporis castaneis, levibus, plerumque late ellipsoideis, rarius subglobosis v. ovatis, apice late rotundatis, medio haud constrictis, basi rotundatis v. interdum sub-attenuatis, $35-47\cdot5 \times 22\cdot5-30\ \mu$; episporio $2\cdot5-3\ \mu$ crasso, apice incrassato usque $9\ \mu$, plerumque ca $7\cdot5\ \mu$ pedicello crasso, persistente, pallide brunneolo, saepe oblique v. transverse inserto, $7\cdot5-8\ \mu$ crasso et usque $100\ \mu$ longo.

Hab. in foliis vaginisque *Andropogonis eucomis* Nees, Donkerpoort, leg. Doidge et Bottomley, 30129.

The uredo has also been collected on *Andropogon huillensis* Rendl. Donkerpoort, Doidge and Bottomley, 30132.

One 3-celled teleutospore was seen. The contents of the uredospores are bright orange, and this gives the orange colour to the uredo-sori.

The teleutospores of the known species of *Puccinia* on South African *Andropogoneae* resemble one another very closely; the uredoform is more distinctive, and the species of rust on these hosts may readily be distinguished when uredo-spores are present. The distinguishing characters are indicated in the following key:—

A. Paraphyses present, germ pores conspicuous.

a. Uredo-spore uniformly thin walled, brown, with

5-8, rather conspicuous, scattered germ pores.... *Puccinia erythraeënsis*.

b. Wall of uredo-spore thickened at the apex.

- x. Apex slightly thickened, up to $4\ \mu$, spore $25-35 \times 17.5-20\ \mu$, 4-6, equatorial germ pores..... *Puccinia amphiphididis*.
 xx. Apex more definitely thickened, up to $8\ \mu$, spore $30-42.5 \times 22.5-30\ \mu$, 2-3 equatorial germ pores..... *Uredo schizachyrii*.

B. Paraphyses wanting.

- a. Germ pores obscure.
 x. Wall of uredo-spore thickened irregularly, cavity stellate..... *Puccinia versicolor*.
 xx. Wall thickened at the apex, up to $9\ \mu$ *Puccinia eucomis*.
 b. Germ pores evident, 4-7, scattered..... *Uromyces Clignyi*.

***Puccinia Bottomleyae* nov. spec.**

Soris uredosporiferis amphigenis, plerumque epiphyllis, oblongis, cinnamomeis, $\frac{1}{2}-\frac{5}{8}$ mm. longis, mox nudis, epidermide fissa cinctis, pulverulentis. Uredosporis saepe etiam teleutosporis immixtis, sub-globosis, ovatis v. ellipsoideis, brunneis, $22-30 \times 20-25\ \mu$, laxe minuteque aculeatis; episporio $1.5-2\ \mu$ crasso, poris germinationis 4-7, sparsis instructis.

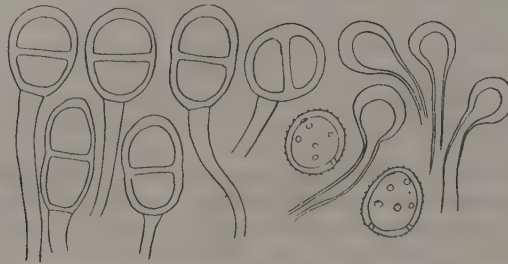


Fig. 15.—*Puccinia Bottomleyae*, teleutospores, uredospores and paraphyses.

Soris teleutosporiferis conformibus, atro-brunneis. Teleutosporis subglobosis, oblongis v. ovatis, castaneo-brunneis, levibus, apice rotundatis, medio haud constrictis, basi rotundatis v. subattenuatis, $27.5-40 \times 20-25\ \mu$; episporio $2-2.5\ \mu$ crasso, apice leniter incrassato, usque $6\ \mu$; pedicello persistente, apice brunneo, $6-6.5\ \mu$ crasso, $85-112.5\ \mu$ longo, nonnumquam oblique inserto. Mesosporis paucis, subglobosis v. ovatis, $25-27.5 \times 22.5\ \mu$. Paraphysibus numerosis, capitatis, brunneolis, $50-100\ \mu$ longis; capite $15-20\ \mu$ latis, membrana leve, $1-1.5\ \mu$ crassa, apice valde incrassata, usque $10\ \mu$.

Hab. in foliis *Aristidae Welwitschiae* Rendl. et *A. barbicollis* Trin. et Rupr., Derdepoort, leg. Doidge et Bottomley, 29793 et 29795.

Aristida adscensionis Linn., Buffelspoort, Marikana, leg. Doidge, 29991; Derdepoort, leg. Doidge et Bottomley, 29790.

Aristida sp., Derdepoort, leg. Doidge et Bottomley, 29789.

***Puccinia digitariae* Pole Evans.**

in Ann. Bolus Herb. 2 (1917), 111; Doidge in Bothalia 2 (1927), 124.

Syn. *Uredo digitariaecola* Thuem. in Myc. Univ. No. 2041 (1882); Syd. Monogr. Ured. 4 (1924), 604.

The illustration of this rust in Bothalia (loc. cit.) is misleading. The teleutospores are closely crowded in the minute, compact sori and are consequently much more irregular in form than the drawing indicates, especially at the apex. One 3-celled spore was seen, and in several teleutospores, germ pores at the apex and just below the septum were observed. The teleutospores are delicate and very easily crushed.



Fig. 16.—*Puccinia digitariae*, teleutospores.

In addition to the hosts previously recorded, i.e. *Digitaria debilis*, *D. eriantha* and *D. Smutsii*, this rust has been found on:—

Digitaria horizontalis Willd., Nelspruit, Liebenberg, 26649.

Digitaria Pentzii Stent, Donkerpoort, Doidge and Bottomley, 29750, Ashbury, Doidge and Bottomley, 29783.

Digitaria setivalva Stent, Salisbury, Hopkins, Rhod. Myc. Herb., 2602 and 2071.

The Rhodesian collection [Hopkins in Trans. Rhod. Sc. Ass. 35 (1938), 106], is designated "*Puccinia digitariae* affinis". From an examination of a portion of this material kindly supplied by Dr. Hopkins, it appears that this rust is typical *Puccinia digitariae*.

***Puccinia eragrostidis-chalcanthae* nov. spec.**

Soris teleutosporiferis epiphyllis, oblongis, 0.5–2.5 mm. longis, sparsis v. aggregatis et confluyendo longioribus, mox nudis, brunneis, pulverulentis. Teleutosporis subglobosis v. oblongis, aureo-brunneis, 26–27.5 × 17.5–25 μ , apice late rotundatis v. obtuse conicis, medio haud constrictis, basi rotundatis; episporio leve, 3–4 μ crasso, apice plerumque incrassato, usque 8 μ ; pedicello tenue, hyalino, persistente, usque 75 μ longo, ad apicem 5 μ crasso, deorsum attenuato.

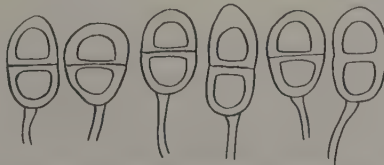


Fig. 17.—*Puccinia eragrostidis-chalcanthae*, teleutospores.

Hab. in foliis *Eragrostidis chalcanthae* Trin., Donkerpoort, leg. Doidge et Bottomley, 29760.

Through the courtesy of Dr. Kern and of Dr. Stevenson of the Division of Mycology and Plant Disease Survey, Washington, a portion of the type collection of *Puccinia eragrostidicola* Kern, Thurston and Whetzel (Mycologia 25, 1933, p. 469) was available for study. The South African rust just described above is near this species, but the teleutospores

are much more variable in form and are thicker walled; the pedicel is hyaline and inserted directly, whereas in *P. eragrostidicola* it is tinted brown and is often oblique. *Puccinia eragrostidis* Petch (Ann. Roy. Bot. Gard. Peradeniya 6, 1917, pp. 209, 216) has narrower, ovoid or oblong-ovoid teleutospores, $20-32 \times 15-17 \mu$, with hyaline, oblique pedicel.

***Puccinia eragrostidis-superbae* nov. spec.**

Soris uredosporiferis amphigenis, plerumque hypophyllis, ochraceis, ellipticis v. oblongis, minutis, usque $\frac{1}{2}$ mm. longis, epidermide fissa cinctis. Uredosporis ovatis, fusco-brunneis, ad apicem obscurioribus, $27-32 \times 17-25 \mu$; episporio $1.5-2 \mu$ crasso, ad apicem saepe leniter incrassato, usque 4μ , sparse valideque echinulato, poris germinationis 4-6, conspicuis, equatorialibus praedito. Paraphysibus satis numerosis, clavatis, rectis v. leniter curvatis, $25-65 \times 8-17.5 \mu$; membrana leve, $1.5-4 \mu$ crasso, ad apicem incrassato usque 12.5μ .

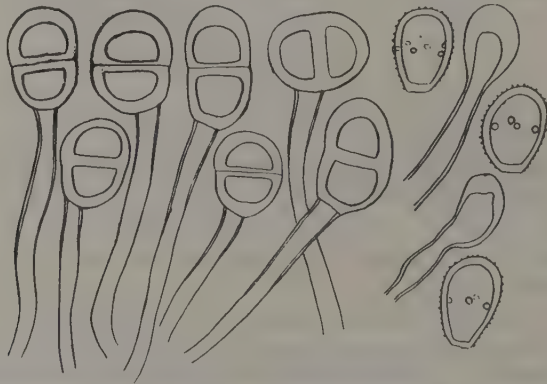


Fig. 18.—*Puccinia eragrostidis-superbae*, teleutospores, paraphyses and uredospores.

Soris teleutosporiferis amphigenis, plerumque hypophyllis, atro-brunneis, oblongis, $\frac{1}{2}-1$ mm. longis, saepe confluendo longioribus, epidermide fissa cinctis. Teleutosporis subglobosis, ovatis v. late ellipsoideis, utrinque rotundatis, medio non vel vix constrictis, $35-45 \times 25-30 \mu$; episporio leve, castaneo-brunneo, cellula inferiore $3-4 \mu$ crasso, cellula superiore $4-5 \mu$ crasso, ad apicem incrassato $8-10 \mu$; pedicello persistente crasso, ad apicem $8-10 \mu$ crasso, brunneolo, usque 112μ longo, membrana crassa.

Hab. in foliis *Eragrostidis superbae* Peyr., Derdepoort, leg. Doidge et Bottomley, 29811; (II) in foliis *Eragrostidis happulae* Nees var. *divaricatae* Stapf. Derdepoort, leg. Doidge et Bottomley, 29813.

***Puccinia miscanthidii* nov. spec.**

Soris uredosporiferis hypophyllis, minutis, sparsis, ca. $\frac{1}{2}$ mm. longis, pulverulentis, luteo-aurantaceis v. cinnamomeis. Uredosporis ovatis, oblongis v. subglobosis, pallide aurantiacis deinde brunneis, $24-30 \times 17.5-25 \mu$; episporio $1-1.5 \mu$ crasso, subtiliter verruculoso, poris germinationis obscuris, ut videtur minutis sparsis.

Soris teleutosporiferis amphigenis, plerumque hypophyllis, sparsis, aggregatis v. seriatim dispositis, $\frac{1}{4}-2$ mm. longis, saepe confluendo longioribus, pulvinatis, atro-brunneis, epidermide fissa cinctis. Teleutosporis castaneo-brunneis, apice saepe obscurioribus, oblongis, clavatis, subglobosis v. irregularibus, apice rotundatis v. conicis, rarius truncatis, medio non vel vix constrictis, basi rotundatis v. subattenuatis, $30-50 \times 20-30 \mu$; episporio leve, $2-2.5 \mu$ crasso, apice incrassato usque 8μ ; pedicello crassiusculo, persistente, ubique brunneolo, ca 10μ crasso, usque 87.5μ longo, saepe oblique, interdum lateraliter inserto.

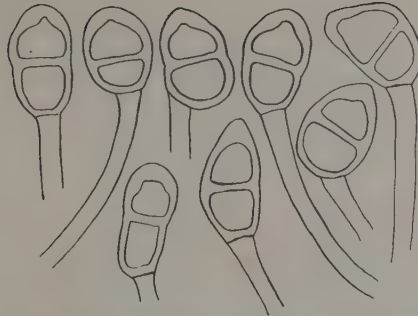


Fig. 19.—*Puccinia miscanthidii*, teleutospores.

Hab. in foliis *Miscanthidii sorghi* Rich., Lundie's Hill, Umkomaas Valley, leg. Doidge 30104; in foliis *Miscanthidii juncei* Stapf., Trigaartspoort, leg. Doidge et Bottomley, 30105.

This species is closely related to *Puccinia imperatae* Doidge on *Imperata cylindrica* Beauv. (*Bothalia* 2, 1928, p. 474) from which it differs in the colour and form of the teleutospores; they are darker brown, more irregular in form and thinner walled; the pedicel is tinted brown throughout, and is frequently inserted obliquely, occasionally transversely.

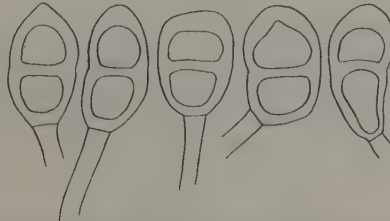


Fig. 20.—*Puccinia imperatae*, teleutospores.

***Puccinia pogonarthriae* Hopkins.**

in Trans. Rhod. Sc. Soc. 35 (1938), 106.

Syn. *Uredo pogonarthriae* Syd. in Ann. Myc. 10 (1912), 35; in *Bothalia* 2 (1927), 198.

Uredo-sori amphigenous, but mostly hypophyllous, scattered, oblong, $\frac{1}{2}$ –2 mm. long, surrounded by the torn epidermis, pulverulent, rusty brown. Uredospores globose or subglobose, light brown, $22\text{--}26 \times 18\text{--}22 \mu$; epispore light golden brown, $1.5\text{--}2.5 \mu$ thick, delicately echinulate and with about six scattered germ pores.

Teleutosori epiphyllous, scattered, oblong, $\frac{1}{2}$ –2 mm. long, dark brown, surrounded by the torn epidermis, soon becoming pulverulent. Teleutospores subglobose or oblong, broadly rounded or obtusely conical at the apex, not constricted at the septum or very slightly so, rounded at the base, golden brown, $25\text{--}40 \times 17\text{--}25 \mu$; epispore smooth, $2.5\text{--}4.5 \mu$ thick, often slightly thickened, up to 8μ , at the apex; germ pore apical or slightly oblique in the upper cell, one-half to one-third of the distance from septum to base in the lower cell; pedicel sub-persistent, hyaline, 5μ thick at the apex, and up to 50μ long.

Hab. on leaves of *Pogonarthria squarrosa* (Light.) Pilg., Donkerpoort, Doidge and Bottomley, 29757.

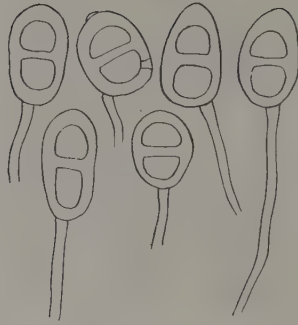


Fig. 21.—*Puccinia pogonarthrae*, teleutospores.

A portion of the type collection was made available for comparison through the courtesy of Dr. Hopkins. The type was collected on the same host at Marandellas (Rhod. Govt. Myc. Herb., 2163); it is evidently the same species as the rust collected at Donkerpoort but the teleutospores of the latter are more variable in form. The description is amended accordingly. The uredo described by Sydow (loc. cit.) on *Pogonarthria squarrosa*, was found on the same leaves.

***Puccinia luxuriosa* Syd.**

in Monogr. Ured. 1 (1904), 812.

Syn. *Puccinia tosta* var. *luxuriosa* Arth. in Bull. Torr. Bot. Club 29 (1902), 229.

Teleuto-sori amphigenous, scattered or in groups, oblong or linear, often confluent and forming striae up to 6 mm. long, rather compact, black. Uredospores mixed with the teleutospores, globose or subglobose, verrucoso-echinulate, yellow brown, 22–30 μ diam.; epispore about 2 μ thick, with six or more scattered germ pores.



Fig. 22.—*Puccinia luxuriosa*, teleutospores.

Teleutospores ellipsoid or oblong, rounded at the apex, usually slightly constricted at the septum, usually rounded at the base, brown, $36-56 \times 20-28 \mu$; epispore smooth, 3–5 μ thick, thickened at the apex, up to 10 μ ; pedicel stout, persistent, brown at the apex and 7–8 μ thick, up to 110 μ long.

Hab. on leaves of *Sporobolus pectinatus* Hack., Donkerpoort, Doidge and Bottomley, 29726.

On *Sporobolus capensis* (Willd.) Kunth, Donkerpoort, Doidge and Bottomley, 29758.

This rust was originally described on *Sporobolus aeroides* in Oregon and Montana, North America; the South African rust agrees well with the description of the American fungus.

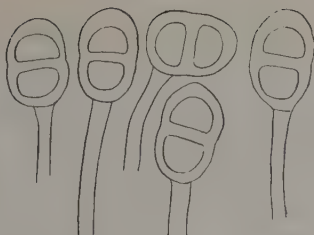


Fig. 23.—*Puccinia tosta*, teleutospores.

Puccinia luxuriosa differs from *P. tosta* Arthur previously recorded on *Sporobolus fimbriatus* Nees (Bothalia 2, 1928, p. 474) in the larger and much more conspicuous sori, the echinulate uredospores, and the definitely larger teleutospores. The teleutospores of both species are illustrated for comparison.

***Puccinia tristachyae* Doidge**

in Bothalia 2 (1927), 132.

The type specimen of this rust was collected at Kaalfontein on *Tristachya Rehmanni* Hack., and the teleutospores were described as follows: "Teleutospores clavate, ellipsoid or oblong, upper cell usually shorter than the lower, rounded or truncate at the apex, rarely subacute, more or less constricted at the septum, attenuate or rounded at the base, golden brown, $40-60 \times 16-23 \mu$; epispore smooth, $1.5-2 \mu$ thick in the lower cell, $2.5-3 \mu$ thick in the upper, rarely very slightly thickened, up to 4μ , at the apex; pedicel persistent, rather stout, light brown, up to 45μ long and 6.5μ thick." The first four spores in the figure are typical of those found in the type collection. (See also Bothalia loc. cit.)

Rust pustules on a recent collection of *Tristachya hispida* K. Schum. are apparently those of the same fungus, but the teleutospores are much more variable than those of the type specimen. A large proportion are typical in form, but comparatively few are $45-55 \mu$ long; the majority are smaller. A large number are irregular in shape, as if through compression; the pedicel is often inserted obliquely and rarely transversely. Mesospores are fairly numerous.

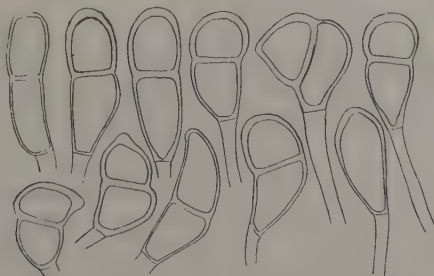


Fig. 24.—*Puccinia tristachyae*, teleutospores.

There is no doubt that the rust on *Tristachya hispida* is a more variable form of *Puccinia tristachyae*, and the description must be amended to include the smaller and more irregular teleutospores found in this collection. It will then read: Teleutospores clavate, ellipsoid, oblong or irregular; upper cell shorter than the lower, or cells sub-equal; apex rounded, truncate or bluntly conical, in the latter case often oblique; more or less constricted at the septum, attenuate or rounded at the base, $30-60 \times 15-30 \mu$; a large proportion of the spores do not exceed 40μ in length; pedicel as previously described, but occasionally oblique and rarely transverse. Mesospores fairly numerous, clavate or cylindrical, $30-53 \times 13-17.5 \mu$.

Hab. on leaves *Tristachya hispida* K. Schum., Donkerpoort, Doidge and Bottomley, 30133.

Ravenelia Evansii Syd.

in Ann. Myc. 10 (1912), 440; Monogr. Ured. 3 (1915), 234; Doidge in Bothalia 2 (1927), 144.

Uredo-sori amphigenous, mostly hypophyllous, also on the petioles, subepidermal, minute, round, scattered or in small groups (usually 2-3), 0.1-0.25 mm. diam., surrounded by the torn epidermis, sub-pulverulent, cinnamon brown, on the same leaflets as the teleuto-sori. (Teleuto-sori are sometimes found on the under side of the leaf, they are not exclusively epiphyllous as the original description might seem to indicate.) Uredospores ellipsoid or ovate, pale yellowish brown, $20-30 \times 12.5-15 \mu$, the length being much more variable than the breadth; epispore $1.5-2 \mu$ thick, occasionally thickened at the apex, up to 5μ , rather closely verruculose-echinulate and with 4 equatorial germ pores. Paraphyses numerous, capitate, yellowish or light brown at the apex, hyaline below, $37.5-50 \mu$ long, $12.5-17.5 \mu$ broad.

Hab. on leaves of *Acacia robusta* Burch., Umzinto, Natal, McClean, 30124.

On *Acacia Gerrardi* Benth., Verulam, Natal, Halse, 30127.

The type specimen described by Sydow (loc. cit.) showed only the teleuto-sori; the accidium was subsequently described in Bothalia. A recent collection from the Natal coast has numerous uredo-sori and a few teleuto-sori on the leaves. Uredo- and teleuto-sori were also found on *Acacia Gerrardi*, which is a new host for this rust.

Ravenelia Halsei nov. spec.

Soris teleutosporiferis amphigenis et petiolicolis, plerumque hypophyllis, sparsis, minutis, rotundatis v. ellipticis, $120-300 \mu$ long, cuticula rupta cinctis, obscure brunneis. Capitulis teleutosporarum leniter convexis, ambitu orbicularibus v. suborbicularibus, subtus leniter concavis, castaneo-brunneis, levis, $80-112 \mu$ diam., ex 9-11 sporis in omni

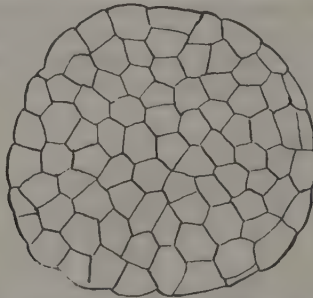


Fig. 25.—*Ravenelia Halsei*, teleutospore heads.

directione compositis; sporis singulis continuis, recte v. oblique cuneatis vel oblongis, $25-30 \mu$ longis, $10-15 \mu$ latis, ad apicem incrassatis ($5-6 \mu$); cystidiis eodem numero quo sporis marginalibus, capitulis dense adpressis, in aqua intumescentibus et tandem ruptis; pedicello brevi deciduo ex hyphis paucis composito, hyalino.

Hab. in foliis petiolisque *Acaciae ataracanihae* DC., Ndwedwe, Natal, leg. Halse, 30117.

Ravenelia modesta nov. spec.

Soris teleutosporiferis subepidermicis, amphigenis v. petiolicolis, plerumque hypophyllis, sparsis, minutis, brunneis, $250-300 \mu$ diam., Capitulis teleutosporarum convexis, subtus leniter concavis, ambitu orbicularibus, suborbicularibus v. irregularibus, $75-105 \mu$ diam., aureo-brunneis, ex sporis $5-6$ in omni directione compositis; sporis omnibus papillis $4-7$ (plerumque 5) subhyalinis v. brunneolis, $3-5 \mu$ longis obsitis; sporis singulis continuis, cuneatis, $27.5-45 \mu$ longis, $13-18 \mu$ latis, ad apicem incrassatis; cystidiis eodem numero quo sporis marginalibus, in aqua intumescentibus; pedicello composito brevi, hyalino.

Hab. in foliis *Acaciae stoloniferae* Burch., Pienaar's River, leg. Doidge et Bottomley, 30110.

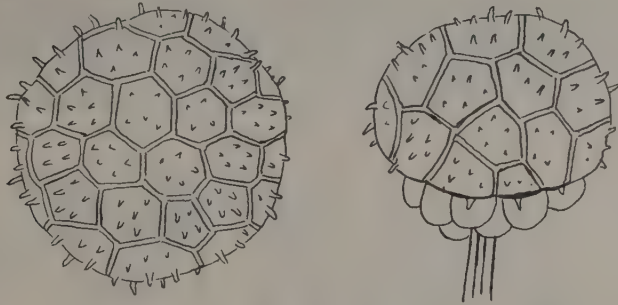


Fig. 26.—*Ravenelia modesta*, teleutospore heads.

This species is near *Ravenelia pretoriensis* Syd., but it differs in several particulars. The heads are more definitely convex; the papillae are longer and more conspicuous, acuminate rather than verruciform, straight, oblique or somewhat curved. The sori are very minute; there is frequently only one and rarely more than 2 or 3 on a single leaflet.

***Ravenelia pretoriensis* Syd.**

in Ann. Myc. 10 (1912), 441; Doidge in Bothalia 2 (1927), 146.

The host of this rust has been wrongly identified; it is definitely not *Acacia horrida* Willd. (= *Acacia karroo*). The branch and leaf characters agree well with those of *Acacia pennata* Willd. and it may be this species; an exact identification is not possible without the pods, which are absent from the material. Further collections will therefore be necessary before the identity of the host can be determined satisfactorily.

In Bothalia (loc. cit.) the drawing of *Ravenelia pretoriensis*, p. 147, is erroneously labelled *R. Pienarii*, and under that of *R. Pienarii* (p. 146) the legend reads *R. pretoriensis*.

***Ravenelia transvaalensis* nov. spec.**

Soris teleutosporiferis amphigenis et petiolicolis; epiphyllis conspicuis, sparsis v. paucis aggregatis, atro-brunneis, rotundatis v. irregularibus, usque 2 mm. diam., epidermide lacerata cinctis; hypophyllis petiolisque inconspicuis, effusis, indeterminatis. Capitulis teleutosporarum convexis, subtus leniter concavis, ambitu orbicularibus, suborbicularibus v. irregularibus, castaneo-brunneis, levibus, 75–100 μ diam., ex sporis 5–6 in omni directione compositis; sporis singulis 30–35 μ longis, 15–17.5 μ latis, ad apicem incrassatis (ca 6 μ); cystidiis numerosis, ut videtur eodem numero quo sporis singulis, ovatis, dependentibus, in aqua intumescitibus; pedicello non viso.

Hab. in foliis *Acaciae detinentis* Burch., prope Pienaar's River, leg. Mogg, 27382.

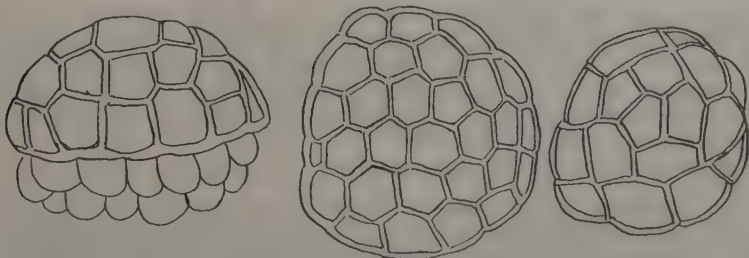


Fig. 27.—*Ravenelia transvaalensis*, teleutospore heads.

Uredo Hyperici-leucoptychoides nov. spec.

Soris hypophyllis, maculis flavis insidentibus, sparsis v. aggregatis, minutissimis, usque 0.2 mm. diam., aurantiacis, mox nudis, ab cellulis epidermidis peridiiformiter cinctis. Paraphysibus numerosissimis, periphicis, clavatis v. clavato-capitatis, saepe irregularibus, 50-100 μ longis, uncinatis, geniculato-incurvatis v. rectis, hyalinis, ad apicem 10-15 μ crassis, membrana 2-4.5 μ crassa, superne plus minusve incrassata (usque 6.5 μ) lumine

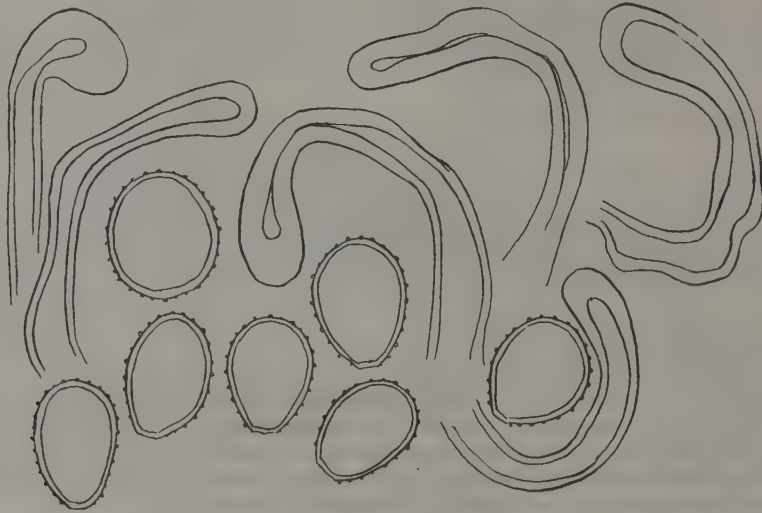


Fig. 28.—*Uredo hyperici-leucoptychoides*, spores and paraphyses.

haud raro fere nullo. Sporis subglobosis, ovatis v. ellipsoideis, pallide flavo-brunneolis, 17-25 x 15-20 μ , subtiliter laxeque echinulatis, episporio ca 1 μ crasso, poris germinationis haud conspicuis (? 4-7 sparsis).

Hab. in foliis *Hyperici leucoptycholis* Steud., Woodbush, leg Doidge, 28467.

This rust closely resembles *Uredo Hyperici-mysorensis* Petch, which occurs in Ceylon, but the paraphyses are longer and stouter. It differs widely from *Uredo Hyperici-Schimperi* P. Henn. described on *Hypericum Schimperi* from Central Africa.

Uredo combreticola nov. spec.

Soris amphigenis, sine maculis, per totam folii superficiem plus minus dense sparsis, rotundatis, ellipticis v. irregularibus, minutis, ca $\frac{1}{4}$ mm. diam., pallide cinnamomeis, epidermide diu tectis deinde poro centrale plus minus late apertis. Sporis solitarie in pedicellis ortis, ovatis, subglobosis v. ellipsoideis, interdum polygonalibus, hyalinis v. pallide flavo-brunneolis, remotiuscule subtiliterque verruculosus, 17-23 x 10-15 μ ; episporio 1-1.5 μ crasso, poris germinationis haud conspicuis.

Hab. in foliis *Combreti Zeyheri* Sond., Nelspruit, leg. Liebenberg, 26038.

This rust differs from *Uredo longaensis* P. Henn. occurring on *Combretum Baumii* on the Longa River, in the character and distribution of the sori, which are more numerous on the upper than on the lower side of the leaf, and are not on leaf spots. The spores are not in chains as in *U. longaensis*.

***Uredo caricis-petitianae* nov. spec.**

Soris hypophyllis, maculis brunneolis indeterminatis insidentibus, plus minus aggregatis v. seriatim dispositis, rotundatis v. ellipticis, usque $\frac{1}{2}$ mm. longis, cinnamomeis, epidermide fissa cinctis. Sporis ellipsoideis, ovatis v. subglobosis, pallide flavobrunneis, laxe verruculosi, $25-30 \times 15-22.5 \mu$; episporio $2-2.5 \mu$ crasso, poris germinationis 2-3 equatorialibus praedito.

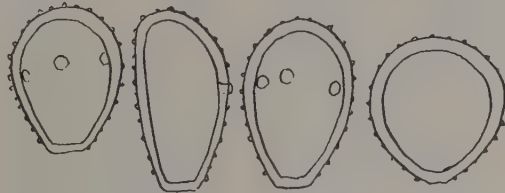


Fig. 29.—*Uredo caricis-petitianae*, spores.

Hab. in foliis *Caricis petitianae* A. Rich, in silvis Xumeni, Donnybrook, leg. Morgan et Doidge, 29830, 30107.

The sori are found almost exclusively near the tips of the long leaves; they are on irregular, brown blotches, which are small at first, but increase in size, and finally involve the whole upper portion of the leaf, which becomes brown and dead. Collections were made in winter and in early spring, but no teleuto-sori were found.

***Uredo scirpi-corymbosi* nov. spec.**

Soris calamicolis, maculis sparsis ellipticis 1.5-7 mm. longis, 1-4 mm. latis, ferrugineobrunneis, tandem plus minus confluentibus insidentibus, solitariis v. paucis parallele aggregatis, linearibus, 2-5 μ longis, diutissime epidermide elevata tectis. Sporis ovatis, ellipsoideis, subglobosis v. pyriformibus, pallide flavo-brunneis, subtiliter sparseque echinulatis, $27-36 \times 20-25 \mu$; episporio tenue ca 1 μ crasso, poris germinationis obscuris (? 3-4 equatorialibus).

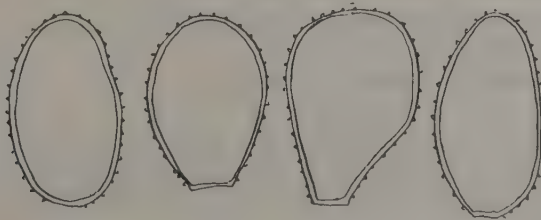


Fig. 30.—*Uredo scirpi-corymbosi*, spores.

Hab. in calamis *Scirpi corymbosi* Roth., Donkerpoort, leg. Doidge et Bottomely, 29986; Skinner's Court, leg. Doidge, 23457; Onderstepoort, leg. Pole Evans, 1314; Debbe's Ravine, leg. Bottomley, 25332.

Uredo schizachyrii nov. spec.

Soris amphigenis, minutis, oblongis, ca $\frac{1}{2}$ mm. longis, epidermide fissa cinctis. Sporidis ovatis v. ellipsoideis, apice rotundatis v. obtuse conicis, castaneis, $30-42.5 \times 22.5-30 \mu$, crasse sparseque echinulatis; episporio $1.5-2 \mu$ crasso, apice incrassato usque 8μ , poris germinationis 2-3 equatorialibus praedito. Paraphysibus numerosis, plerumque capitatis interdum clavatis, $35-62.5 \mu$ longis, ad apicem $12.5-17.5 \mu$ crassis; capite subgloboso brunneolo, membrana leve, valde incrassata ($7.5-15 \mu$) et lamellata.



Fig. 31.—*Uredo schizachyrii*, spores and paraphyses.

Hab. in foliis *Schizachyrii semiberbis* Nees, Donkerpoort, leg. Doidge et Bottomley, 29766.

Uromyces limonii (DC.) Lev.

in Dict. d'Hist. Nat. Art. Uredinees (1840) 19; Syd. in Monogr. Ured. 1 (1904) 41. Syn. *Puccinia limonis* DC. Fl. franc. 2 (1805) 595 et Syn., p. 45.

Aecidium statices Desm. Plant. crypt. de France no. 132.

Aecidium limonii Duby Bot. Gall. 2 (1830) 904.

Caeoma staticis Rudolphi in Linnaea 4 (1829) 510.

Uredo limonii Duby Bot. Gall. 2 (1830) 1897.

(Aecidia amphigenous, often on brown or reddish leaf spots, in round groups, or elongated to 5 mm. long along the veins, usually briefly cylindrical, white, with lacerated margin. Aecidiospores angular-globose or ellipsoid, closely and minutely verruculose yellowish, $21-32 \times 18-26 \mu$.)

Uredo-sori amphigenous, scattered, usually round, oblong on the stems, long covered by the epidermis, at length naked, pulverulent, cinnamon brown. Uredospores globose, subglobose, ovate, ellipsoid or oblong, densely verruculose, yellow brown, $22-32 \times 20-28 \mu$; epispore $1.5-2.5 \mu$ thick, germ pores 2-3, scattered.

Teleuto-sori on the leaves and stems; on the leaves amphigenous, but usually developing more freely on the under surface, scattered or in concentric rings, round or oblong, remaining for some time covered by the blistered epidermis, which finally ruptures and surrounds the

sorus; sori pulvinate, dark brown or almost black. Teleutospores golden brown to chestnut brown, subglobose, oblong or clavate, apex broadly rounded or obtusely conical, direct or oblique, base rounded or attenuate, $24-50 \times 14-25 \mu$; epispore smooth, $1.5-2 \mu$ thick, thickened at the apex up to 10μ ; pedicel stout, persistent, tinted brown, $5-6 \mu$ thick at the apex and up to 88μ long.

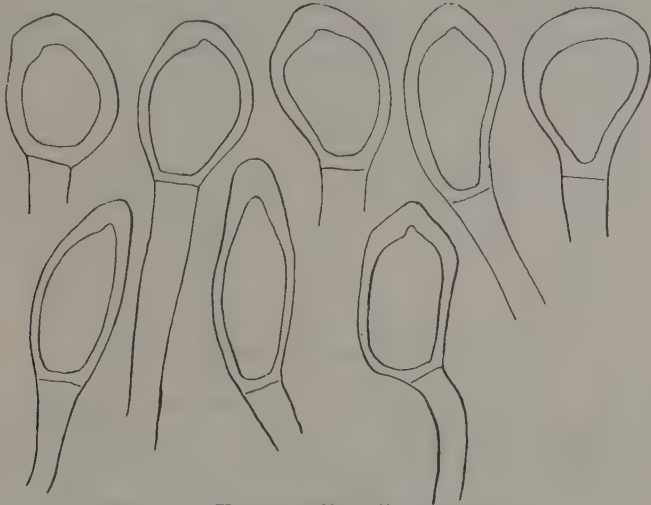


Fig. 32.—*Uromyces limonii*, teleutospores.

Hab. on leaves of *Limonium latifolium* Kuntze (= *Statice latifolia* Sm.), Pretoria, Taylor, 23819; Hartebeestpoort, Bottomley.

This rust has not previously been recorded as occurring in South Africa, and has only recently made its appearance in gardens where flowers are grown on a commercial scale. The leaves examined showed a gross infection. Teleutosori were abundant, a few uredospores being found mixed with the teleutospores. No aecidia were seen, the description quoted being that given by Sydow (loc. cit.).

***Uromyces Strauchii* Doidge**

in *Bothalia* 2 (1928) 473.

on leaves of *Cluytia daphnoides*, Alexandria, Doidge, 22370.

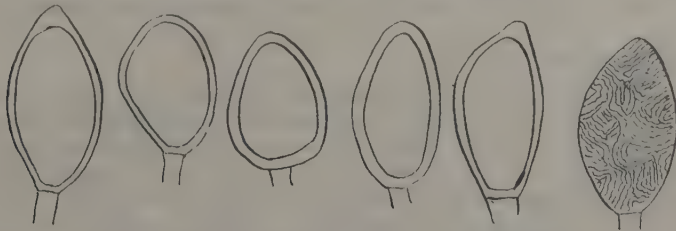


Fig. 33.—*Uromyces Strauchii*, teleutospores.

No illustration of this species was published with the original description. Drawings of the teleutospores are reproduced in the accompanying text figure, chiefly to indicate the nature of the sculpturing of the epidermis.

Uromyces antholyzae Syd.

in Ann. Myc. 2 (1904) 27; Monogr. Ured. 2 (1910) 252.

Uredo-sori amphigenous, not on leaf spots, or on vaguely discoloured areas of the leaf, round or transversely oblong, scattered or in transverse groups between the veins; or caulicolous, scattered or in groups with the longer diameter perpendicular, in groups roughly oval in outline and up to 5 mm. long; sori small, about $\frac{1}{2}$ mm. diam., long covered by the epidermis. Uredospores globose or subglobose, rarely ellipsoid, almost hyaline, $17.5-23 \mu$ diam., minutely verruculose; epispore $1-1.5 \mu$ thick, germ pores obscure.



Fig. 34.—*Uromyces antholyzae*, teleutospores.

Teleuto-sori amphigenous, similar to the uredo-sori but dark brown. Teleutospores subglobose, ovate or oblong, often irregular by compression, brown, $20-25 \times 15-20 \mu$, apex rounded, flattened or obtusely conical; epispore smooth, $1.5-2 \mu$ thick, thickened at the apex, $4-7 \mu$; pedicel persistent, rather stout, light brown, $5-6.5 \mu$ thick and up to 32μ long.

Hab. on leaves and stems of *Antholyza nervosa* Thun. (= *Anapalina revoluta* N. E. Br.) Ruytersbosch, Mossel Bay, Gemmel (O.F.S. Herb. no. 8053) 30085.

The original description gives wider limits to the size of the teleutospores, otherwise the South African fungus agrees in every detail with the rust collected by Schimper on *Antholyza abyssinica* in Abyssinia.

This rust has been recorded on the same host by Verwoerd [in Union Department of Agriculture, Bull. 88 (1929) p. 5] from Stellenbosch, Newlands and Knysna.

Uromyces massoniae nov. spec.

Aecidiis amphigenis, maculis indeterminatis insidentibus, in greges rotundatos, v. elongatos usque 1 cm. diam. plus minus dense dispositis, cupulatis, flavidis, margine revolutato inciso, $300-450 \mu$ diam.; cellulisi peridie in series regulares dispositis, firme conjunctis, subrhomboideis vel penta-v. hexagonis, $25-37.5 \times 15-25 \mu$, pariete exteriori striato $7-10 \mu$ crasso, interiore verrucoso $4-5 \mu$ crasso. Sporibus subglobosis vel ellipsoideis, plerumque angulatis, $22-27.5 \times 15-22 \mu$, dense minuteque verruculosis; episporio $1-2 \mu$ crasso.

Soris uredosporiferis amphigenis, plerumque hypophyllis, sparsis, rotundatis v. irregulariter rotundatis, epidermide fissis cinctis, pulverulentis, cinnamomeo-brunneis, usque 1 mm. diam. Uredosporibus subglobosis, ovatis v. ellipsoideis, $20-27.5 \times 20-25 \mu$, flavis, echinulatis; episporio $2-2.5 \mu$ crasso, poris germinationis pluribus (?4-6) sparsis parum manifestis praeditis.

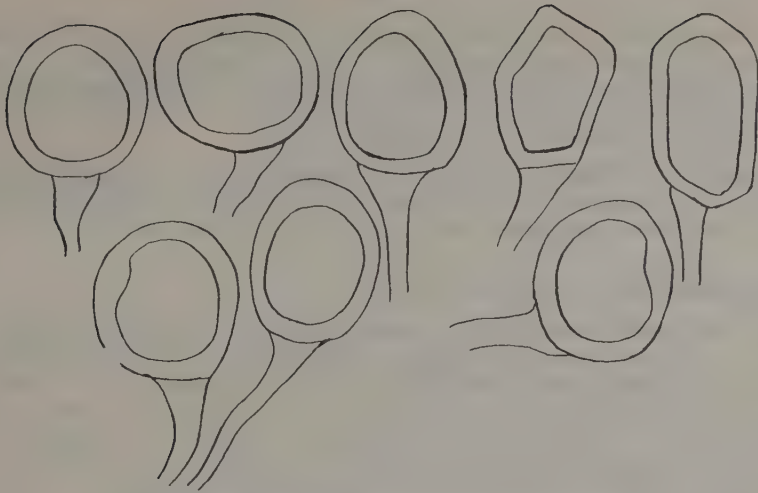


Fig. 35.—*Uromyces massoniae*, teleutospores.

Soris teleutosporiferis amphigenis circa soros uredosporiferos annulum efficientibus vel sparsis, atris, minutis, diu epidermide tectis. Teleutosporis e mutua pressione quoad formam variabilis, subglobosis, ellipsoideis, pyriformibus, saepe angulatis, castaneo-brunneis, levibus, apice rotundatis, $25-32.5 \times 22.5-27.5 \mu$; episporio $3-4.5 \mu$ crasso; pedicello subpersistente, $15-25 \mu$ longo, apice leniter colorato, $5-7.5 \mu$ crasso.

Hab. in foliis *Massoniae latifoliae* Linn. f., Fauresmith, leg. van der Plank, 25447.

Uromyces eriospermi Kalch. et Cke. affinis.

***Uromyces Clignyi* Pat. et Har.**

in Journ. de Bot. 14 (1900) 237; Syd. Monogr. Ured. 3 (1910) 320.

Uredo-sori hypophyllous, scattered, often in series, but rarely confluent, minute, oblong, up to 1 mm. in length, long covered by the epidermis, yellow brown. Uredospores globose or subglobose, golden brown, echinulate, $22-30 \mu$ diam.; episporium $2-2.5 \mu$ thick with 4-7 small, scattered germ pores.

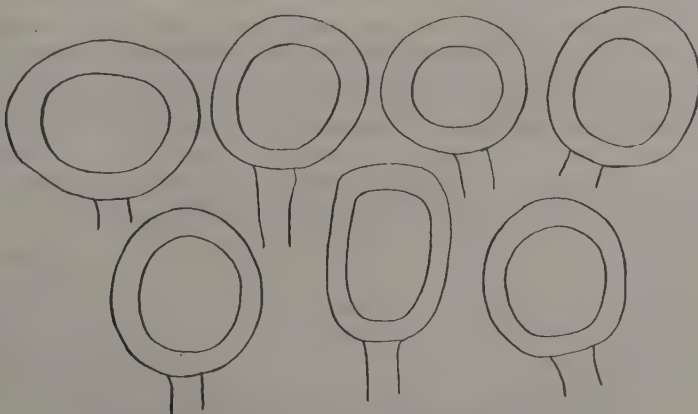


Fig. 36.—*Uromyces Clignyi*, teleutospores.

Teleuto-sori similar in form, dark brown to black. Teleutospores globose or subglobose, dark brown, becoming almost opaque, $22-32\ \mu$ diam.; epispore smooth, $4.5-6\ \mu$ thick, not thickened at the apex; pedicel hyaline, equalling the spore or longer.

Hab. on leaves of *Andropogon amplexans* Nees, Donkerpoort, Doidge and Bottomley, 29751; Derdepoort, Doidge and Bottomley, 29788.

This species was originally described from tropical Africa on *Andropogon* sp., and on *A. multinervis* in the region of the river Niger and in Abyssinia. It also occurs in America. *Uromyces Clignyi* has not previously been recorded on *Andropogon* spp. South Africa.

***Uromyces trichoneurae* nov. spec.**

Soris uredosporiferis amphigenis, minutis, sparsis. Uredosporis subglobosis, late ellipsoideis v. ovoideis, saepe subangulatis, flavo-brunneis, $27.5-37.5 \times 22.5-27.5\ \mu$; episporio $1-1.5\ \mu$ crasso, brunneolo, subtiliter echinulato, poris germinationis 3 equatorialibus praeditis.

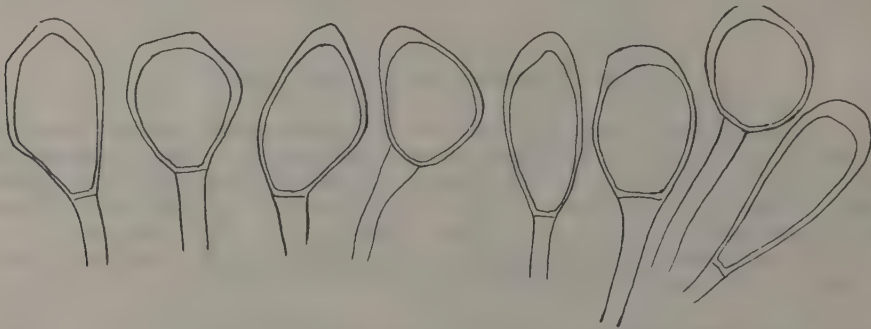


Fig. 37.—*Uromyces trichoneurae*, teleutospores.

Soris teleutosporiferis plerumque epiphyllis, minutis, usque $\frac{1}{2}$ mm. longis, interdum confluenso hinc inde majoribus, usque 3 mm. longis. Teleutosporis quoad formam variabilis, subglobosis, ovatis, oblongis v. piriformibus, saepe angulatis, $20-35 \times 16-19\ \mu$, apice rotundatis, truncatis v. conicis, basi rotundatis v. attenuatis; episporio leve, $1-1.5\ \mu$ crasso, apice incrassato usque $5\ \mu$; pedicello subpersistente, crassiusculo, apice brunneolo, circ. $5\ \mu$ crasso et usque $35\ \mu$ longo.

Hab. in foliis *Trichoneurae grandiglumis* (Rendl.) Stapf et Hubb., Donkerpoort, leg. Doidge et Bottomley, 29762; Derdepoort, leg. Doidge et Bottomley, 29792.

I am indebted to the botanists in the National Herbarium for the revision of the host plants, and in particular to Miss L. C. Chippendall, who kindly identified a large number of grasses.

Text figures were drawn to scale, but the illustrations of spores of *Puccinia* spp. have been reduced by half as compared with those of species of other genera.

A REVISION OF THE SOUTH AFRICAN SPECIES OF ADENIA.

by

L. C. C. Liebenberg

INTRODUCTION.

The genus *Adenia* was founded by Forskal on a plant collected in Arabia and which he named *A. venenata*. In the original description, the genus is stated as having 6-merous flowers. Ascherson, (1)* as pointed out by Engler, first drew attention to the fact that *Adenia* Forsk. (1775) and *Modecca* Lam. (1797) were synonymous. Engler (5) states that it is absolutely certain that *Modecca abyssinica* Hochst. and *Adenia venenata* Forsk. are identical although the former is 5-merous, explaining that it is quite possible that Forskal had a specimen with 6-merous flowers in front of him as "in the related genus *Keramanthus*, 6- and 5-merous flowers occur". Engler further explains (l.c.) that he attempted to separate the two genera but was unsuccessful. The majority of workers had apparently, as suggested by Ascherson, overlooked or not recognised this fact.

Smith (17) in 1821 substituted *Blepharantes* Sm. for *Modecca* Lam. Wight and Arnold (20) in 1834 divided the genus *Modecca* into two subgenera *Microblepharis* Wight & Arn. and *Blepharantes* (Sm.) Wight & Arn. Roemer (14) in 1846 divided *Modecca* into the genera *Microblepharis* (W. & A.) Roem. and *Erythrocarpus* Roem. while Bentham and Hooker (3), 1867, distinguished 2 genera *Ophiocaulon* Hook. f. and *Modecca* Lam. recognising *Clemanthus* Klotsch., *Paschanthus* Burch. and *Kolbia* Beauv. as synonyms of *Modecca*. Baillon (2), in 1888, divided *Modecca* into three sections, *Eumodecca* Baill., *Ophiocaulon* (Hook. f.) Baill. and *Keramanthus* (Hook. f.) Baill. thus further enlarging the conception of the genus by incorporation of the latter two genera. Engler (l.c.) in 1892, added two more sections to Wight and Arnold's division of the genus *Adenia* (in which *Modecca* was included), viz. *Euadenia* Engl. and *Hildebrandtiothamnus* Engl.

In 1893 Harms (6) wrote: "Von hohem Interesse ist die Anatomie der Gattungen *Adenia*, *Ophiocaulon*, *Echinothamnus* und *Keramanthus*. Es scheint mir bei diesen der anatomische Bau ganz deutlich auf eine enge Zusammengehörigkeit hinzuweisen." He (7) in 1895 subscribed to Engler's division of the genus *Adenia* in which he not only included (like Bentham and Hooker) the genera *Clemanthus* Klotsch. and *Kolbia* Beauv., but also *Keramanthus* Hook. f. each representing only one species. In 1897 he (8) further enlarged the genus incorporating 3 genera, viz. *Paschanthus* Burch. (= *Jaggia*, Schinz.), *Echinothamnus* Engl. and *Ophiocaulon* Hook. f. The first 2 monotypic genera were combined, constituting his sect. 1 *Paschanthus*, while the last, comprising some dozen closely related species in tropical and southern Africa, constituted his section 2, *Ophiocaulon* previously raised to this position by Baillon in 1888, as noted above. In addition to this the section *Hildebrandtiothamnus* (originally his sect. 4) was sunk and the genus *Keramanthus* given sectional rank as was also previously done by Baillon. De Dalla Torre and Harms (1907) have upheld this division of *Adenia* in the 5 sections, *Paschanthus*, *Ophiocaulon*, *Blepharantes*, *Keramanthus*, *Microblepharis* and *Euadenia*. In 1921, however, the section *Microblepharis* W. & A. was not included by Harms (10) but in 1925 (11) he resuscitated it.

* Figures in parenthesis refer to "Literature Cited" on page 544.

None of these sections, as defined by Harms, will allow for the inclusion of *A. glauca* and *A. spinosa*, two apparently very closely related species, differing mainly in the presence of spines and simple leaves in the one species as opposed to compound leaves in the other species—both without glands (“Coronaschuppen”, etc.). Harms (11) includes *A. glauca* in *Blepharantes* presumably based on Schinz’s description of this species in which he (Schinz) described the petals as “im Grunde des Receptaculums inseriert” which the present writer did not find to be the case. (See discussion under *A. glauca* on p. 523.) The following is a summary of the synonymy of the genus *Adenia* Forsk. accepting the conception of Harms [presumably based, to some extent at least, on his extensive studies of anatomic characters (referred to elsewhere)] and certain other workers mentioned above :—

- 1775. *Adenia* Forsk. Fl. Aeg. Arab., p. 77.
- 1797. *Modecca* Lam. Encycl. meth. bot. lv., 208.
- 1807. *Kolbia* P. Beauv. Fl. d’Oware et Ben., 11.91.
- 1821. *Blepharantes* Smith Gramm. of Bot., 188.
- 1822. *Paschanthus* Burch., in Burch. Travels 1, 543.
- 1846. *Microblepharis* M. Roem., Synops. 11, 133, 200.
- 1846. *Erythrocarpus* M. Roem., Synops. Mon. 11, 204.
- 1863. *Clemanthus* Klotsch., Peters Reise Mossamb. Bot., 143.
- 1867. *Ophiocaulon* Hook. f., Gen. Plant, 1, 111, 813.
- 1876. *Keramanthus* Hook. f., Bot. Mag. T., 6271.
- 1889. *Jäggia* Schinz., Verh. Bot. Ver. Brand, XXX, 253.
- 1891. *Echinothamnus* Engl., Bot. Jahrb. 14, 383.

The genus has attracted attention in South Africa mainly as a result of the poisoning of human beings from *A. digitata*. In 1922 poisoning (and one death) of adults was reported as a result of the chewing of the tubers of *A. digitata* which were mistaken for that of a cucurbitaceous plant. Previously Burt Davy reported death and poisoning of children as well as suspected poisoning from this species. In 1928 death of a child and poisoning of others were also ascribed to this species. A study of its poisonous principles at the Veterinary Research Laboratory, at Onderstepoort,* revealed two toxic principles, hydrocyanic acid and a toxalbumin, “Modeccin”. Steyn (18) reports that hydrocyanic acid has been found in the fresh leaves of this species as well as that of *A. glauca*, but in the latter case not in the “root” which he states is edible. Dr. E. E. Galpin reported in December, 1931, that he had observed children eating the fruits of *A. glauca*, which they said were very nice. According to Watt and Brandwyk (19), *A. senensis*, *A. gummifera* and *A. Kirkii* are used medicinally.

Harvey states that the fruits of *A. hastata* are edible; Bryant states that *A. repanda* is greedily eaten by stock which is also reported for *A. hastata*; Potts (13) states that natives, when thirsty, suck the sap of the “tuber” of *A. multiflora*, but this information must be incorrect as will be explained further on, and the confusion is very probably attributable to the fact that *A. glauca* occurs in the same locality and is nontoxic and edible. Forskal described *A. venenata* as having poisonous tubers while *A. palmata* is also said to be poisonous.

The South African species which represent only a very small percentage (approximately 10 per cent.) of the world’s species have been recorded mainly from the Transvaal. The genus is largely restricted to the tropics of the old world and from Africa approximately 50 species have been described. It is of more than usual interest as it exhibits some most interesting plant forms (Plates 1, 2, 3 and 4).

* Green, H. H., and Andrews, W. H., 1923 : The toxicity of *A. digitata* Burt Davy (*Modecca digitata* Harv.) 9th and 10th Rpt. Dir. Vet. Educ. & Res., pp. 381-91. Green, H. H., and Kamerman, P., 1924 : The protein phytotoxin with special refce. to the new “modeccin” Journ. S.A. Chem. Inst. 7, pp. 3-5.

There are in South Africa (and South West Africa) the desert-arid region forms, *A. repandu* (Burch.) Engl. and *A. Pechuelli* (Engl.) Harms, the latter being a plant of very strange habit. At the other extreme there is the interesting, widely distributed, liana, *A. gummifera* (Harv.) Harms, which often grows to enormous size with very long woody thick stems, up to $2\frac{1}{2}$ and 3 inches diameter. Intermediate forms are represented by several species in South Africa, two types being distinguished, viz. one with a fleshy swollen axis partly or largely above the soil (Plates 1-4), the other with a tuberlike underground portion from which the annual branches arise. In the former case the green or above-ground swollen main axis assumes more or less characteristic shapes in the different species. Of this type there are only 4 described species, one, *A. globosa* Engl., occurring in East Africa, the other 3 having been recorded from South Africa and that, with the exception of two specimens only, from the Transvaal. Judging from the figures of the spinescent *A. globosa* Engl., it would seem that this species is not closely related to any of the 3 South African species of similar habit, amongst which there is also a spinescent species.

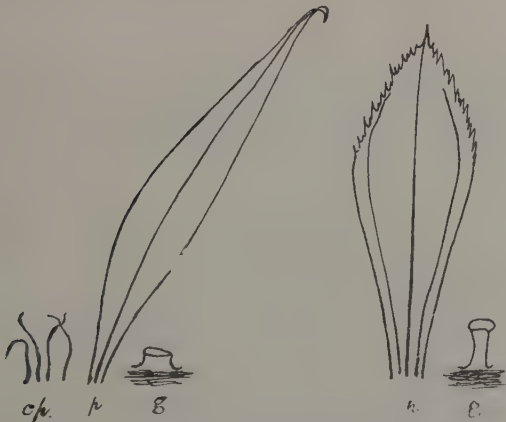


Fig. 1.—Variation in petal, gland and coronal processes in two flowers from Obermeyer in Trans. Mus. 29287, ♀, belonging to *A. digitata* (Harv.) Engl.

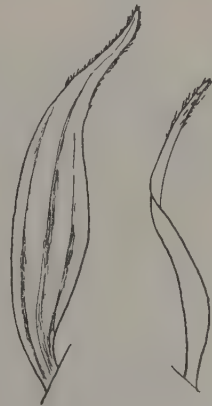


Fig. 2.—Two petals from two different flowers from Liebenberg 3366, ♀, belonging to *A. digitata* (Harv.) Engl.

The Root-stem Relations.

In the absence of anatomic proof the writer has adopted the view that the tuberlike structure when below ground only (which is normally the case in *A. repanda*, *A. senensis*, *A. Wilmsii*, *A. digitata* and *A. hastata*) is entirely a root structure except for the attenuated perennial portion at the top thereof, from which the annual branches arise and which is formed from accumulated annual growths or from elongation or enlargement of the bud-producing zone. When the swollen perennial main axis is largely or partly above the ground (as in the case of *A. fruticosa*, *A. spinosa* and *A. glauca*) then the underground portion is regarded as root structure and the aboveground part (green portion) as stem structure, the soil level being regarded the line of demarcation between the two kinds of structures. The annual axes or stems are referred to as branches. This characterisation is resorted to only as a matter of convenience for the description of the species.

MORPHOLOGICAL NOTES AND STUDIES.

The Flower.

The classification of certain species of *Adenia* is not only made more difficult by leaf heterophyly but also by polymorphism and the presence of male and female flowers on different individuals (very rarely on the same individual) and to some extent by marked variations in floral structures, within the species, although on the same individual there usually appears to be little variation (figs. 1, 2 and 3). It may be pointed out that in the majority of the species polymorphism is very apparent, the difference in structures of the flower being marked in the two sexes apart from the obvious differences (abortion of androecium and gynaecium respectively) as a result of the unisexual nature of the flower. This is particularly characteristic of the petals.

In the literature there are two interpretations of the morphology of the flower parts and the writer has adopted the interpretation which follows hereunder, in which is included a description of the main features of the flower.

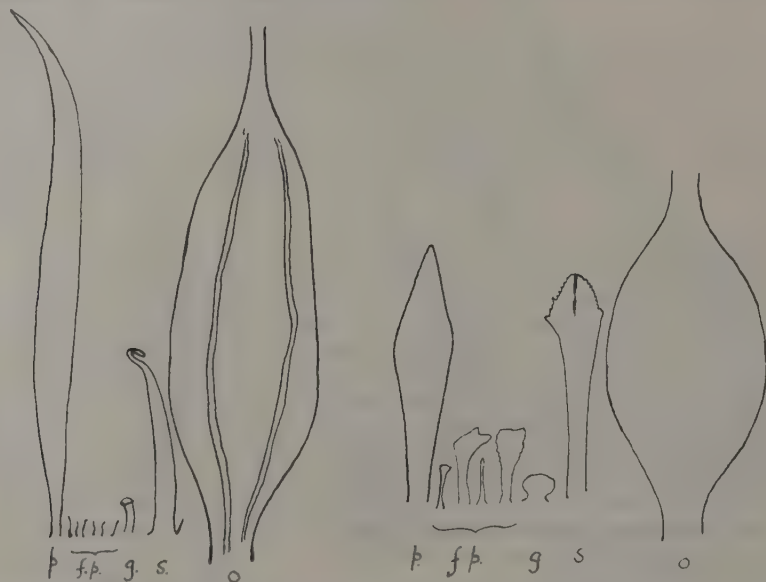


Fig. 3.—Variation in petal, gland, coronal processes, ovary and staminode in two flowers A and B from Liebenberg 3056, ♀, belonging to *A. digitata* (Harv.) Engl. A is from the original specimen and B from a specimen grown in the gardens of the D.P.I. o, ovary; s, staminode; g, gland; fp, coronal processes; p, petal.

Receptacle.

That part of the flower more or less below the "glands" (q.v.) and above the articulation with the pedicel. The articulation is never absent.

Calyx tube.

Part of the "receptacle" of Harms, Engler, etc.

Calyx lobes.

(5). The "sepals" of Harms, Engler, etc.

Corolla.

Petals 5, alternating with the calyx lobes, inserted at the sinuses of the latter or at varying depths on the calyx tube, depending upon the species.

Corona.

The filiform processes which arise from the calyx tube near its base and are arranged in a sinuate ring or in groups in a circle. "Korona" (in part) or "Effigurationen" (in part) of Harms. This is homologous to the prominent structure in certain other genera of the family, e.g. *Passiflora*.

*Androecium.**

In the male flower 5 stamens and in the female flower 5 staminodes either free or otherwise connate for part of their length at the base. The staminal or staminodal column is adnate to the receptacle (? and/or calyx tube), at 5 points (always opposite the petals), so forming 5 depressions or pockets from the base of which arise the "glands".

*Gynaecium.**

In the female a normal stipitate ovary with numerous ovules on 3 placentae (parietal) and a 3-branched style and puffy stigma. In the male an abortive structure semiterete linear-cylindric in shape somewhat tapering upwards, surrounded by the staminal column. The fruit is a capsule, normally 3-valvate, dehiscent or indehiscent, with anatropous arillate seeds.

Glands.

(5). The 5 structures which arise from the base of the pockets or depressions and which alternate with the petals. "Receptaculum-effigurationen," "Zungenförmige Schuppen," "Corona Schuppen," "Schuppenförmige Effigurationen," "Outer staminodes," "glands of the disc." This term (gland) is used for convenience, as these structures may actually be "Outer staminodes" or even the vestiges of an aborted coronal structure. Absent in certain species.

The slender processes ("corona") vary a great deal in the various species, being rudimentary in certain individuals or certain of the South African species. Their absence, together with the absence of glands in any particular species may perhaps be looked upon as a sufficiently strong reason to exclude such species from the genus *Adenia*. These processes when numerous or in a continuous circle around the calyx tube very often appear to arise from the edge, or to be the lacerated margin or upper part, of a membranous tissue which lines the base of the calyx tube (? or uppermost part of the receptacle) and it is apparently also this same tissue which joins the filamental column (collar or tube) formed by the connate filaments or staminodes, to the base of the calyx tube at 5 points, so forming the 5 pockets or depressions. This membranous tissue is often clearly seen in certain flowers (when dissected) and such a wider conception of the corona seems also to be justified by the occurrence of these processes on the tissue joining stamens to calyx (and/or receptacle?) in such species as *A. glauca* or *A. spinosa*.

THE INFLORESCENCE.

The inflorescence in *Adenia* presents interesting features and in order to understand these and the variations better, particular attention was paid to it. The main features in the various species are discussed elsewhere. At this stage the general features will be dealt with.

Harms (9) has made a special study of the morphology of the inflorescence and tendrils in the *Passifloraceae*. Speaking about the "Inflorescensträger oder Pedunculus", he states that for *Adenia*: "Dieser trägt seltener nur einen, meist zwei Seitenäste, während er in der Mitte in eine Ranke ausläuft. Die blüthentragenden Seitenzweige zeigen cymöse Verzweigung in mannigfacher Art und verschiedenem Grade". The typical *Adenia* inflorescence is a longer or shorter "peduncle" terminating in a tendril and having two

* As stated, in the S. African spp. dioecism is practically the rule.

opposite or alternate side branches or "cymes" which may be repeated one or more times. Common variations—with reference to the South African species—are (1) the absence (non-development) of one or both cymes, when the peduncle may terminate in a flower-bearing pedicel; (2) the peduncle terminating in a pedicel.

Harms further states: "Im allgemeinen wiederholt sich die dichasiale Verzweigung mit Ausbildung einer Mittelblüte einige wenige Male oder es gehen durch Fehlschlagen eines der beiden Seitenästchen die Dichasien schon bald oder erst by Achsen höherer Ordnung in Monochasien über". Presumably under dichasial branching Harms includes those cases where the side-branches ("Seitenästchen") are not only opposite but also alternate and this is essentially the nature of the inflorescence in the South African species, in which sidebranches are always alternate except perhaps those (of the first order) arising on the peduncle. In the South African species the standard groundplan for the inflorescence is one in which each relative main axis (always with terminal flower) has usually two lateral branches with a tendency either towards the monochasial (only 1 bract, with or without its side-branch present) or towards the trichasial or pleiochasial* (where more than 2 alternate bracts, with or without their side-branches are present).

The switching over to a mono-, tri-, or pleiochasium, particularly the latter two, is apparently of unusual occurrence in the South African species because the youngest relative main axes practically always bear two alternate bracts with buds. On the older axes, however, this may sometimes occur.

In accordance with the law of development in the cymose inflorescence, the uppermost side branch of each relative main axis is the oldest (and most developed) and naturally flowers on this are relatively older than those of the branch below it. The branches of any relative main axis are always alternate, and it very rarely happens that such branches fail to develop in due course, i.e. is only represented by a bract, without a bud, unless of course they are the youngest bracts on the inflorescence. That portion of each relative main axis which bears the flower (that is the pedicel) is often pushed aside and is less developed than the side-branches.

All flowers (by definition) are borne terminally on each relative main axis (which may or may not be repeated one or more times) and are therefore pedicellate, besides being articulate. Not only does the distance between the side-branches (or their bracts) vary a great deal in different species but also on the same inflorescence or on the same or different individuals. The pedicel length is subject to similar variation due to the position of the oldest (or nearest) relative bract very rarely being so short as to appear to be lacking or almost so, as, for example, in *A. Wilmsii*.

If then the side-branches remain undeveloped and their respective bracts are displaced to their uppermost limit (i.e. bordering the articulation) the flower will appear sessile and bracteolate. This is observed in *A. Wilmsii* (fig. 13). Further modification gives us the inflorescences of many species of *Passiflora* as pointed out by Harms and others. In these the "peduncle" has undergone maximum reduction so that tendril and side-branches (or only 1 side-branch) arise side by side in the axil of the leaf having their bracts forced (displaced) on to their respective axes thus giving on each 3 bracts (2 bracteoles and 1 bract)† which in the various species of *Passiflora* assume various positions or modifications from the three scattered narrow bracts to involucre of various shapes and sizes.

Although, to some extent, the characters of the inflorescence differ somewhat in the different species and are fairly constant for certain species, there is a marked variation in one or two of the species (e.g. *A. digitata*) and they would therefore not appear to be suitable for the characterisation of species.

* A 4th side branch, represented by a bract, has only been observed once (in Fig. 15).

† This is not uncommon in the case of *A. glauca*.

Harms refers to inflorescence dimorphism in the two sexes, e.g. in *A. venenata* but such has not been established for the South African species. He also records the occurrence of "traubenähnliche Blütenstände" in certain species, in which category the reproductive branchlets of *A. gummifera* and *A. Wilmsii* may presumably be placed.

The interesting behaviour in *A. gummifera* (Harv.) Harms, to which Engler and Harms have drawn attention, should here be mentioned. In this species (and presumably in related species, according to these workers) there are usually 2, sometimes 3, buds in the axils of the leaves, the lowermost of which develops into a tendril or strong inflorescence, the other into a branchlet of varying size. This branchlet may at times give the impression (with leaf abscission or ? non-development of leaves) of being a compound inflorescence. As noted elsewhere these "secondary" inflorescences of the branchlets, apparently (in the South African specimens), always (?) end in pedicels, not in tendrils. Presumably Engler and Harms have only observed this branchlet ("Seitenzweig Spross") above (i.e. in the axil of) a tendril and not above an inflorescence. In the South African material, this branchlet has been observed above a strongly developed inflorescence in which the main axes (peduncles) terminate in tendrils.

VARIATION AND ABNORMALITIES IN THE SPECIES.

In his researches on the utilisation of the anatomic structure for the limitation and division of the *Passifloraceae*, Harms in 1893 drew attention to the differences as well as variations, in the anatomic structures exhibited by the various related genera and species of the *Passifloraceae* (including *Modeceae*) for the latter group of which he particularly suggests the possible value of characters like "Bau des Holzes, die Excrete des Blattes (Krystalzellen, 'Drüsen', Gerbstoffbehälter) und die Haarbildung", the latter term being used in a sense to include the curvature of the cells of the epidermis. At the same time he points out that a number of these characters vary a great deal and should only be used with care for the limitation of species, although the above-mentioned characters as well as others such as strength of outer epidermis walls, structure of mesophyll, etc., could be utilised for such purpose.

In the revision of the South African species, the present writer has experienced great difficulty in classifying certain specimens belonging to a group which he has referred to as the "digitata-senensis-complex". He has observed great variation in leafshape, in glands and in the number of "ruby-coloured" or giant cells (presumably the "Gerbstoffbehälter" of Harms) on the upper and lower surfaces of the leaves of specimens of the same species and even on the same specimen, as well as variation in the waxy covering in the same species. Variation in the "ruby-coloured cells" (viz. the "Gerbstoffbehälter") is only a reflection of the anatomic variation of the species. In view of this fact and the variation observed by Harms for several of his anatomic characters (in the same species) the writer does not feel that the classification of a difficult group like the "digitata-senensis-complex" would be much facilitated by the study of anatomic differences. Differences in anatomic characters would no doubt be more marked in the case of those plants that are not so closely related or those that are easily separated on morphological characters. Whether, however, anatomic characters will have taxonomic value in cases where the comparatively numerous morphological characters have failed, that is, where the latter vary so much that classification is impossible or very difficult, seems doubtful.

A. hastata (Harv.) Schinz

In this species fairly wide variations are evident in the characters of the inflorescence; in size and stoutness of the inflorescence, including tendril and in stoutness of tendril in relation to the peduncle. The "cymes" are usually opposite and few of the peduncles terminate in pedicels, tendrils being usually present. In the number of flowers to a "cyme" there is a wide difference. The majority of specimens have 1-flowered or 1- to 2-flowered

cymes but several specimens are up to 5- or 6-flowered (or more?). On the same specimen the number of flowers to a cyme is quite constant. It may be noted that of three sheets of Rogers 12606 one sheet showed typical 1-flowered "cymes", while the other two were both many-flowered.

It is interesting to note that the apical glands of the leaf (paired glands at the apex of the leaves) are sometimes absent on some specimens.

In figs. 4 and 5 two drawings of inflorescences of this species are shown.

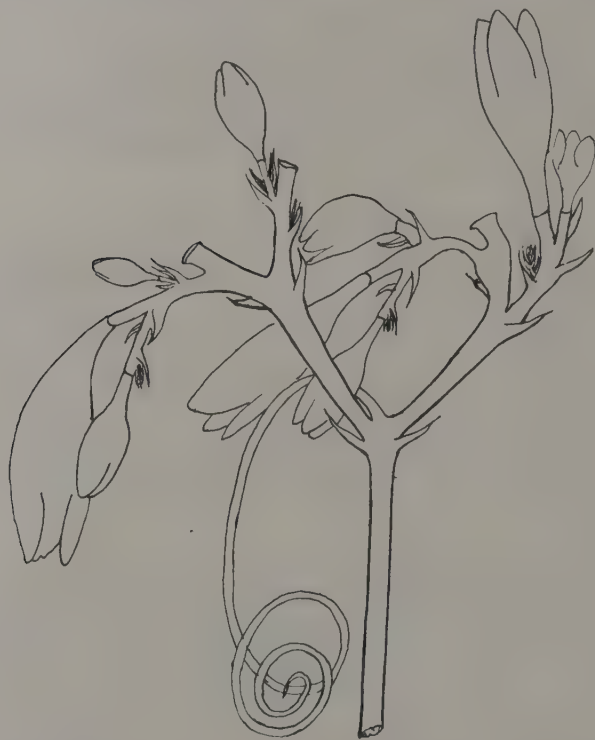


Fig. 4.—Typical inflorescences of *Adenia hastata* (Harv.) Schinz., enlarged several times. From Rogers in Trans. Mus. 13273, ♂.

Very great variations were observed in size and shape of flower and the parts thereof. This was particularly noticeable in the case of the petals which varied from entire or almost so, in some specimens, to the characteristic fimbriate ones (the processes of the petals being of very variable length) of the species, in the males.

The following abnormalities were observed :—

Rogers 13273 : A sixth petal arising much below the others and differing somewhat from them.

Thorncroft 2034 : Calyx lobes and petals 4-merous (stamens 5). Apparently only 1 flower of this nature.

Breyer 17956 : Small leaves in axils of some inflorescences.

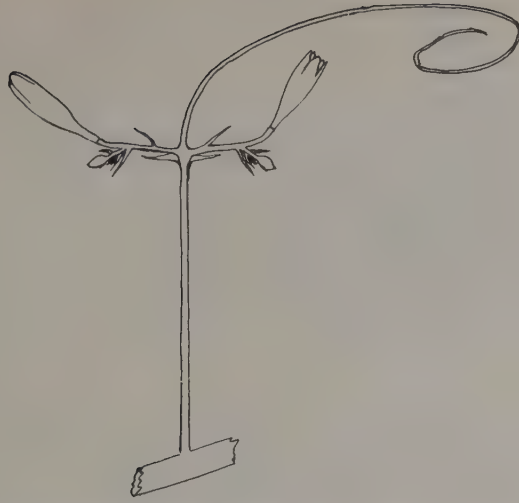


Fig. 5.—Typical inflorescences of *Adenia Hastata* (Harv.) Schinz., enlarged several times. From Thorncroft 2034, ♂.

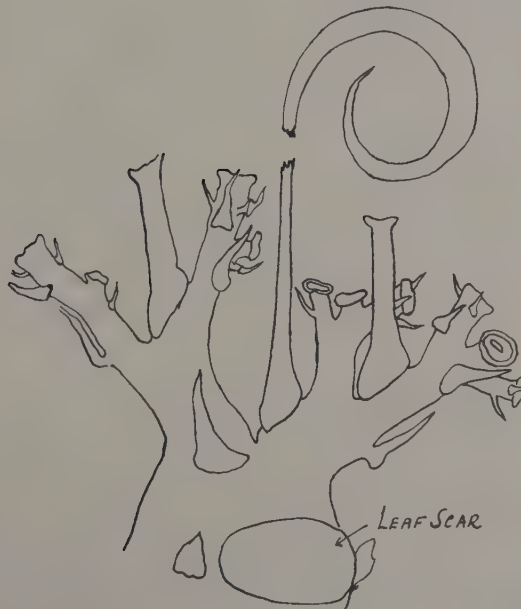
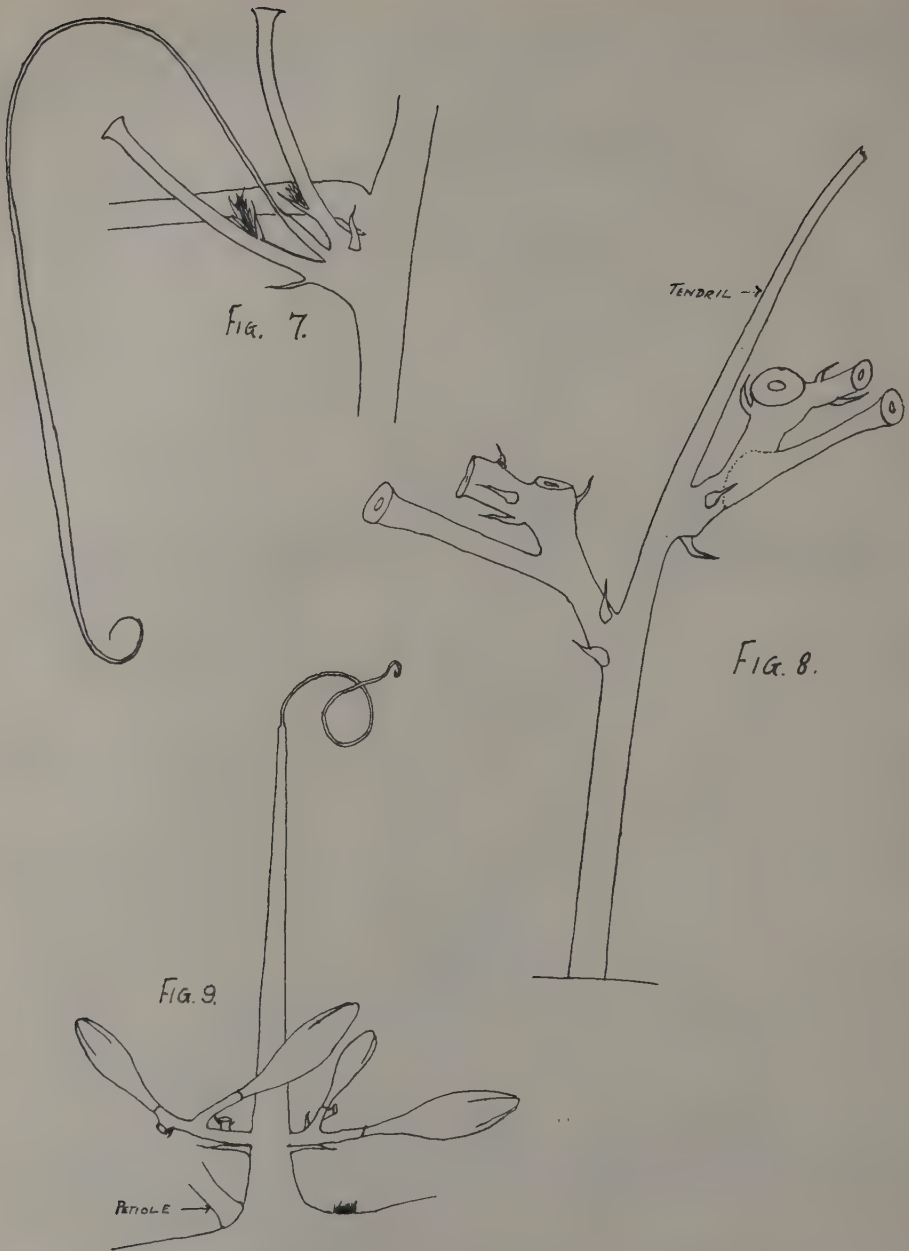


Fig. 6.—Inflorescences of *A. glauca* Schinz., enlarged many times. From Galpin 11605, ♀.



Figs. 7 and 8.—Inflorescences of *A. glauca* Schinz, enlarged many times. 7 and 8 are from Galpin 13197, ♀.

Fig. 9.—A typical inflorescence of *A. spinosa* Burt Davy, enlarged many times. From Bremekamp and Schweickerdt in Trans. Mus. 29882, ♂.

A. glauca Schinz

Except for fairly marked variations in the inflorescence, this species is fairly uniform in its flower parts.

What is unique is that occasionally the inflorescences are clustered at the bases of flowering shoots or of branches or of branchlets but also often occur at the bases of tendrils and in these cases the "cymes" are very contracted or apparently only represented by single pedicels (with flowers) on very reduced peduncles. In the latter cases there are no tendrils, though peduncles usually end in tendrils. Usually, however, inflorescences are axillary (axils of leaves) fairly short (with no visible peduncles) with "cymes" 1- to 2-flowered but occasionally many-flowered, ending in tendrils though not infrequently in long (flower-bearing) pedicels. Like the stipules the bracts are reddish brown and those of the undeveloped side-branches are often found to be displaced along their respective axes.*

In figs. 6, 7 and 8 two typical inflorescences are shown. No abnormalities were observed.

It should be pointed out here that the writer has not been able to find any glands in this species although marks were observed (grouping of "veins") coinciding with the position of glands in the ordinary *Adenia* flower. Schinz in describing this species (l.c.) states that "Die unanschaulichen Receptaculumeffigurationen, die den Staminodien opponiert sind, haben zungenförmige Gestalt". He further states that the petals "finden wir im Grunde des Receptaculums inseriert". The present writer has always observed the petals to be inserted at the sinuses of the calyx lobes ("Kelchblätter" of Schinz), that is at the upper margin of the "Receptaculum".

A. spinosa Burt Davy

In this species the inflorescences are usually axillary (axils of spines or those of leaves), the "cymes" being many-flowered although occasionally 1-few-flowered. Inflorescences are usually much reduced (compact). Such reduced inflorescences not only occur in the axils of spines but are, not infrequently, also clustered near the base of the latter. The thorn may be considered as the modified main axis of the inflorescence for not only does it often function as a tendril, but it usually has buds near the base corresponding to the position of the main branch of the inflorescence and, in fact, occasionally possesses normal cymes (Bremekamp and Schweickerdt 469 in Transvaal Museum). This type of inflorescence is shown in fig. 9. It also is of interest to record the presence of leaves in, what appears to be, normal, axillary, reduced inflorescences. There are usually 2 to 3 flowers present and such inflorescences are perhaps to be regarded as very reduced branchlets, arising, it would appear, in the axils of spines, not in those of leaves, as axillary inflorescences do. Presumably such branchlets should be interpreted as truly axillary, being the development of a second bud in the leaf axil.

No abnormalities or marked variations were observed.

A. gummifera (Harv.) Harms

The occurrence of both primary and secondary inflorescences is interesting. The former occur in axils of leaves while the latter occur on almost leafless branches which arise in the axils of primary inflorescences. Secondary inflorescences are not visibly axillary as leaves have often not developed or have dropped early. The 1-many-flowered "cymes" are usually alternate and usually the peduncles end in tendrils (though sometimes in pedicels), but "cymes" are occasionally also opposite. One or both of the cymes may be undeveloped (rudimentary) when they are represented by their bracts only or very little besides. Not infrequently the inflorescence consists only of 2 bracts and a long terminal flower-bearing pedicel. Peduncles are usually well-developed, particularly in the primary inflorescences where they are often very long (up to 10 cm.).

* The bases of tendrils and the pedicels of the primary branches are also red-coloured.

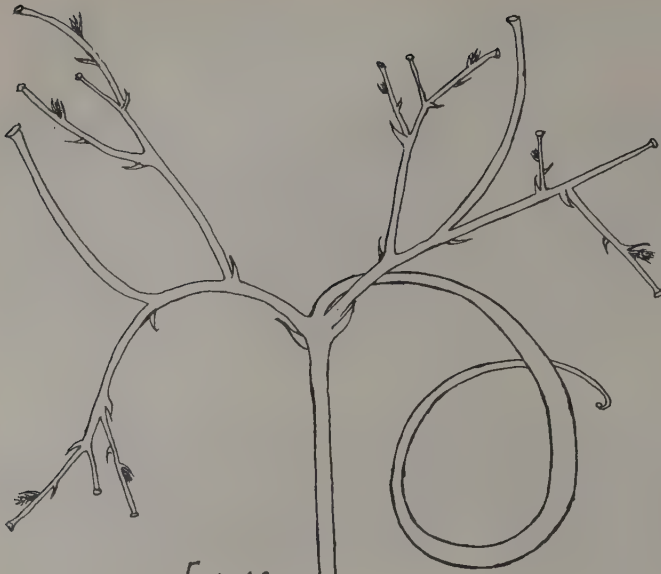


Fig. 10.

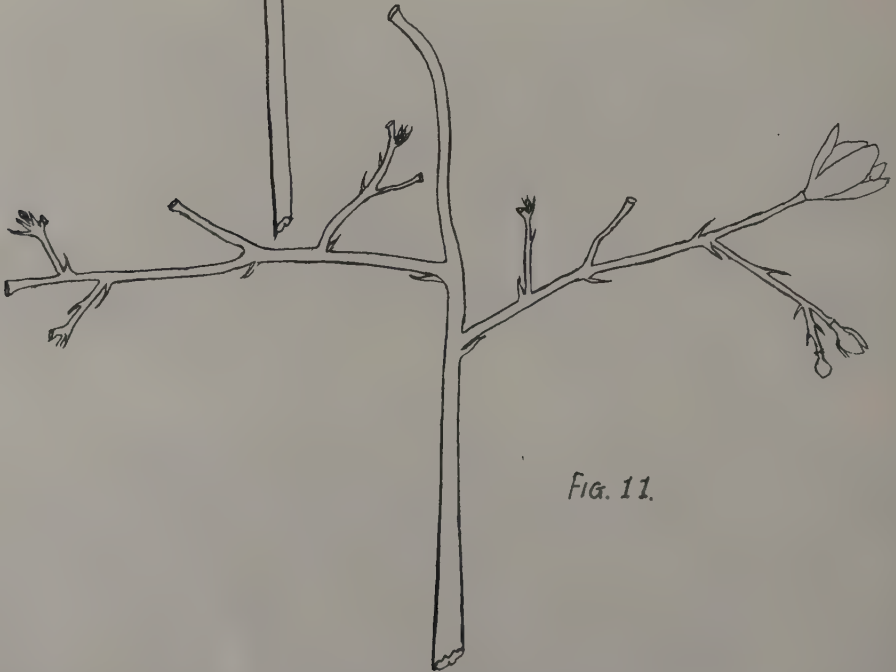


Fig. 11.

Figs. 10 and 11.—Inflorescences of *A. gummifera* (Harv.) Harms, enlarged several times. 10 is from Wylie in Natal Herb. 23313, ♀. 11 is from Watt and Brandwyk 1497.

In Figs. 10 and 11 two inflorescences of this species are shown. No abnormalities were observed.

With regard to floral structures, it can be recorded that this species does not show any marked variations and neither are the variations in other morphological characters very pronounced. Although differences in leaf shape, leaf size, number of large "Gerbstoffzellen" (black dots), etc., are quite noticeable.

A. repanda (Burch.) Engler

The inflorescences are usually small, insignificant, the bracts characteristically long. In some cases, particularly at the base of branches, they are so reduced that the flowers appear to be solitary, the "cymes" being rudimentary and the shortened peduncle terminating in a flower-bearing pedicel, not a tendril. Inflorescences are axillary. The "cymes" are very rarely opposite and one or both of them may develop, usually only the one develops; it may be the lower or the upper. The "cymes" are characteristically 1- to few-flowered. The peduncles end in pedicels (this usually is the case at bases of branches) or tendrils (usually this occurs towards apices of branches). Occasionally both cymes are undeveloped.

In Fig. 12 are shown some typical inflorescences.

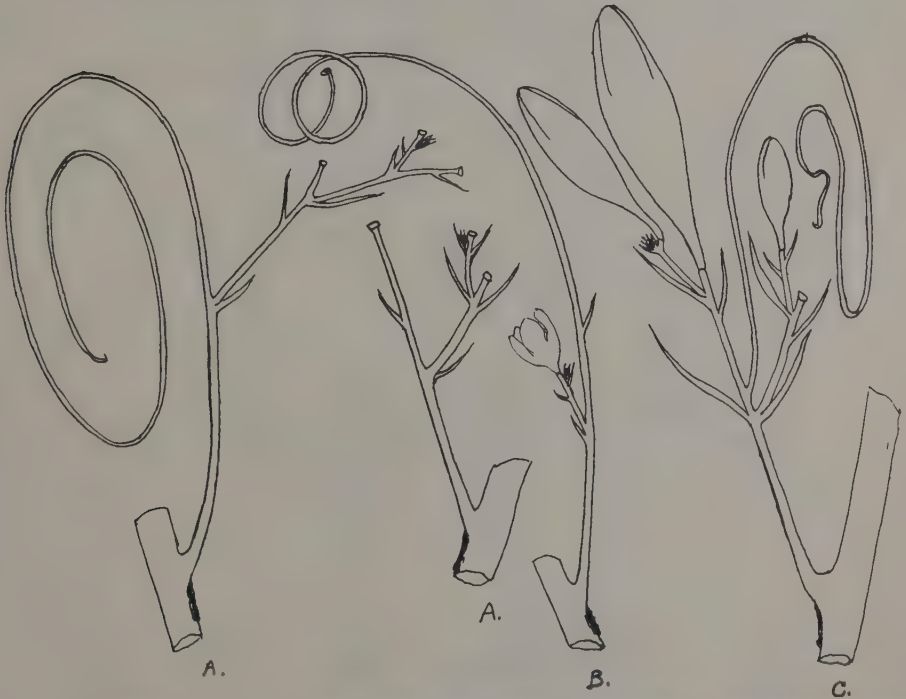


Fig. 12.—Inflorescences of *A. repanda* (Burch.) Engl. several times enlarged. A is from Pearson 8166 (Natal Herb.), B is from Dinter 4516, ♀, and C is from Marloth 1092, ♂.

On the whole this species is very uniform, showing a very narrow range of variation except perhaps for the insertion of petals. No abnormalities were observed other than 4 small sessile flower buds (side by side) on one of the tendrils in Marloth 1092 (in National Herbarium).

A. Wilmsii Harms

Of this species only a few specimens are available and the variation is not great except for leafsize. The species appears to produce different types of shoots, that is vegetative, reproductive and normal and these do not, apparently, arise at the same time on the same plant. The normal shoots have 1- to 3-flowered axillary inflorescences with the main axis (peduncle) always terminating in a flower and not a tendril. This terminal flower of the main axis is normal but one or both of the sidebranches (of the main axis) may be undeveloped. The reproductive shoots are reduced main stems with several alternate axillary inflorescences in which the leaves are considerably reduced, almost bractlike and the inflorescences more elaborate than in the normal shoot. The bracts on the main axis of the inflorescence or on any of its sidebranches may occupy any position on their respective axes and may sometimes be so close to the articulation as to give the flower the appearance

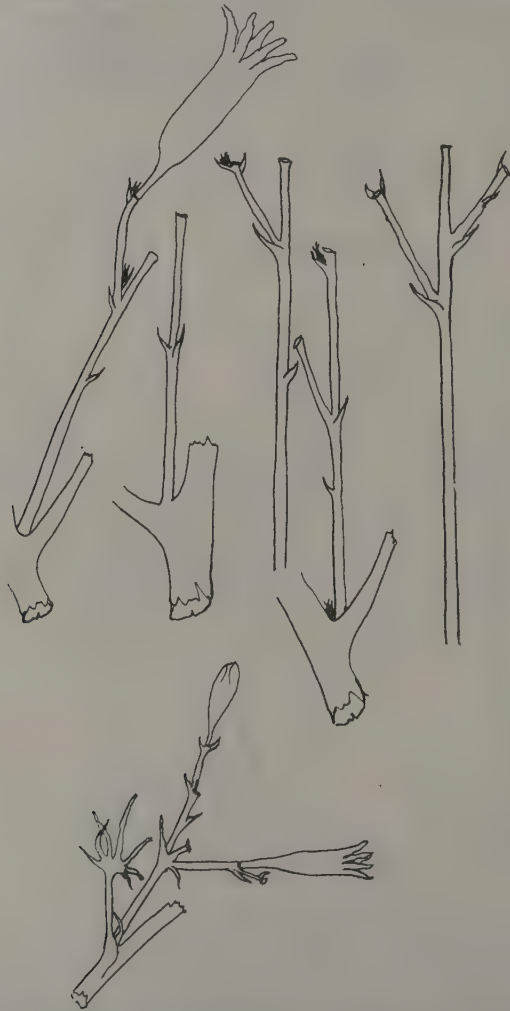


Fig. 13.—Inflorescences of *A. Wilmsii* Harms, several times enlarged. From specimens coll. by Miss van Wyk (Nation. Herb.).

of an axillary origin. In Fig. 13 inflorescences are depicted. The glands or nectaries at the apex of the pedicel are sometimes present in 2 pairs and not 1, which fact along with unusually broad petiole and peduncle, as well as the extra pair of lobes (7 altogether) rather suggests a degree of fasciation as being hereditary for this species which character may possibly have arisen as a mutation in the original species from which it was evolved.

A. digitata (Harv.) Engl.

In this species very marked variations were observed. The variation in leaf characters, particularly in shape and number of leaf lobes is a very striking feature as can be gauged from the photographs (Plates 16-36). As pointed out further on some of these forms had been mistaken for new species by other workers. In characters of the inflorescence and of flowers the variations are almost equally striking. Thus, the peduncle which is generally about 2 cm. long may often be absent or up to 6.5 cm. long. Or again, the flowers, which are usually 4-12 per inflorescence may often be only 2 and sometimes as high as 40 or 80. The distribution of giant cells (Gerbstoffbehälter) on the underside of the leaf has also been observed to be extremely erratic even on the same specimen and on the same leaf. Some typical inflorescences are shown in Figs. 14-17.

A few abnormalities were noted as follows: *Osborne in Nat. Herb.* (2639), 3 glands. *Rogers* 24185 bract adnate to the receptacle, 6 calyx lobes, 6 stamens and in a second flower only 4 stamens and 3 minute peglike outgrowths from the base of the anther. *Galpin* 13196, 2 stamens have their anthers and free filaments connate. *Breyer in Trans. Mus.* 24215, 1 flower with 6 calyx lobes and 6 stamens.

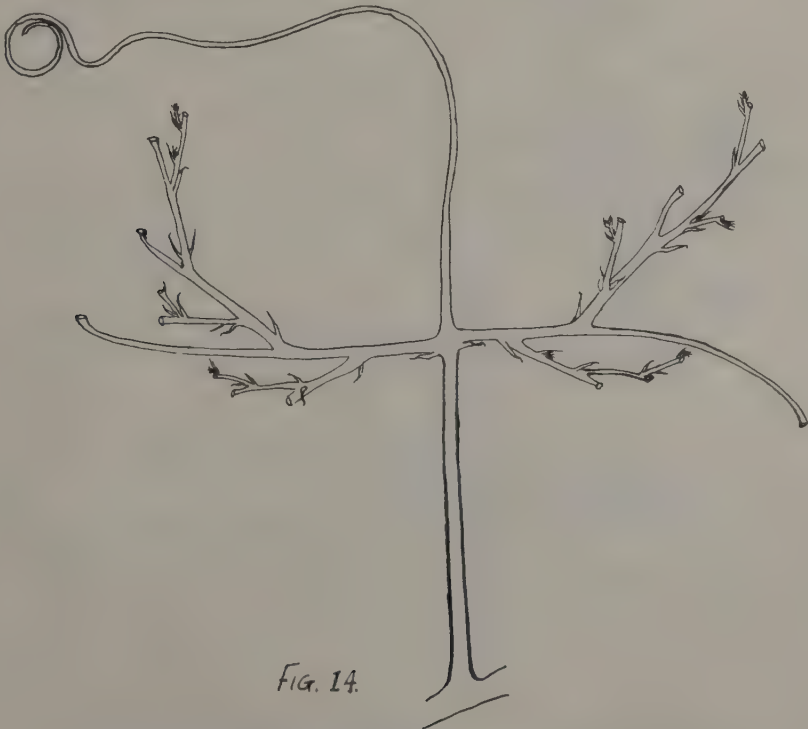


FIG. 14.

Fig. 14.—Inflorescence of *A. digitata* (Harv.) Engl., from Schweickerdt in *Trans. Mus.* 30164, ♂. Enlarged.

A. fruticosa Burt Davy

Inflorescences are 1- to 3-flowered, axillary; peduncles lacking or up to 3 or 4 mm. long, ending in normal flowers not tendrils, the latter being bracteate or non-bracteate, strong or weak. Tendrils occur in axils of leaves and branches in axils of tendrils. Leaf size is very variable.

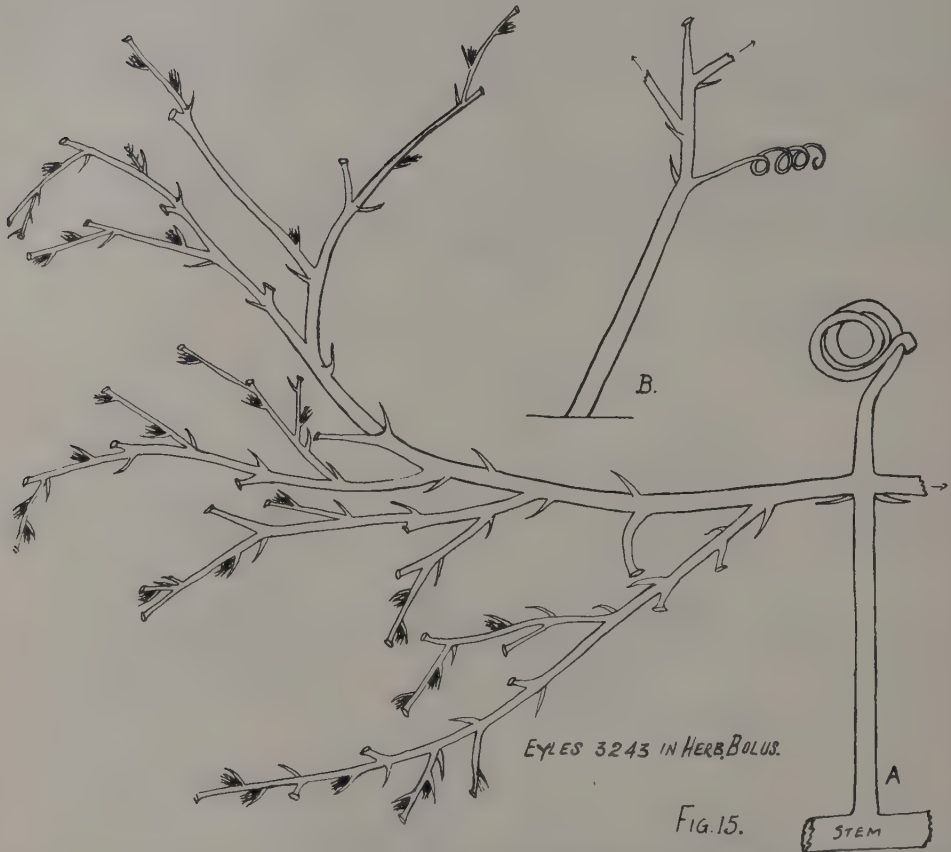


Fig. 15.—Inflorescence of *A. digitata* (Harv.) Engl., from Eyles 3243 (Bolus Herb.). Enlarged several times.

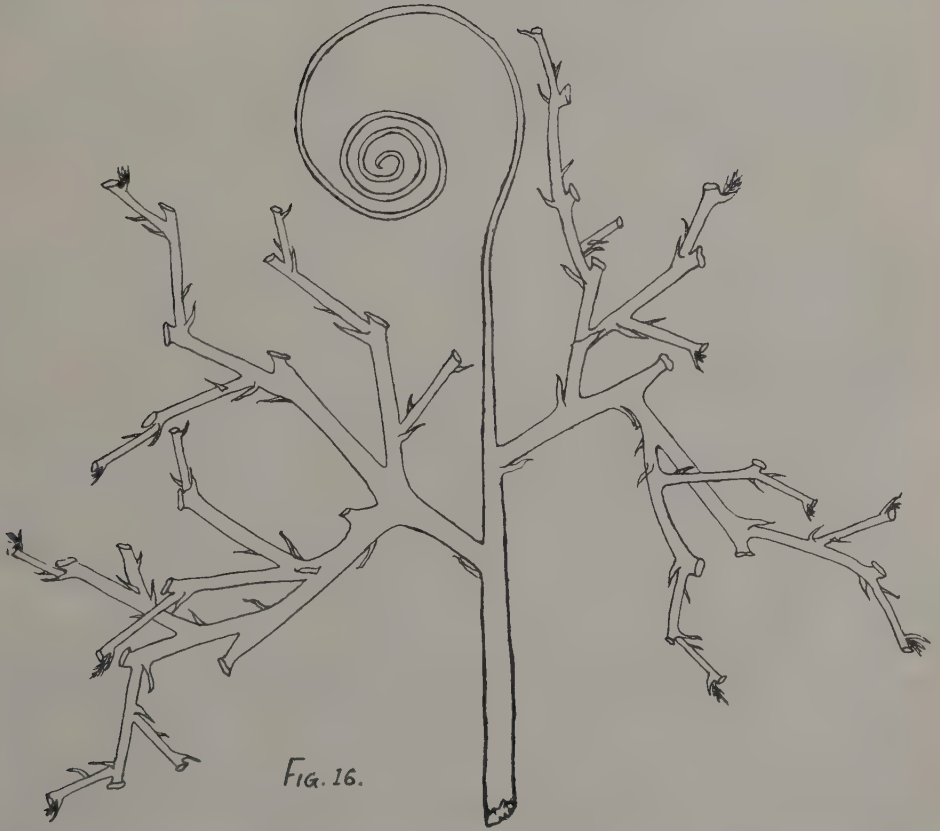


Fig. 16.—Inflorescence of *A. digitata* (Harv.) Engl., from Mogg 8182, ♀. Enlarged several times.

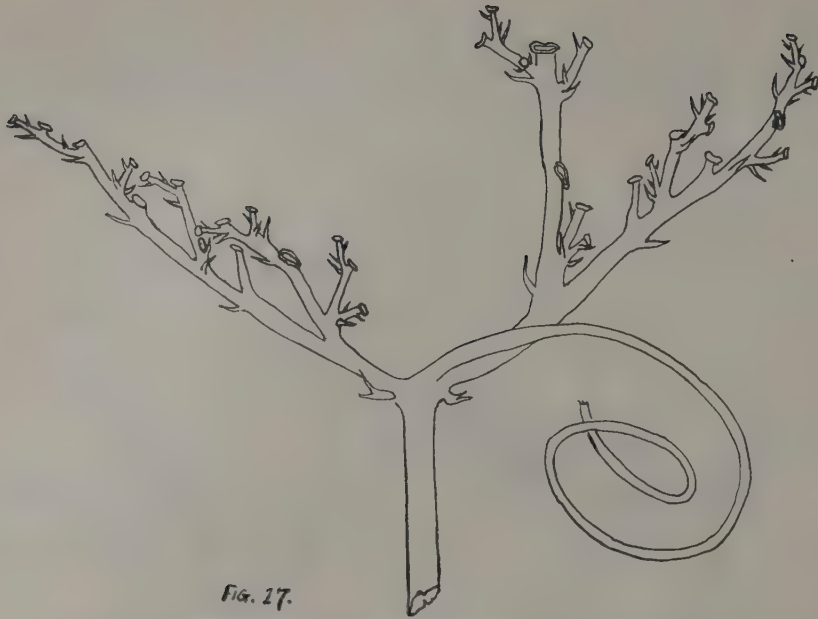


Fig. 17.—Inflorescence of *A. digitata* (Harv.) Engl., several times enlarged.
From Osborne in Nat. Herb. 2639, ♂.

NATURAL RELATIONSHIPS AND CLASSIFICATION OF THE SOUTH AFRICAN SPECIES.

Of the eight species which the writer distinguishes, six, to our present knowledge, are practically limited to South Africa. Under such conditions one would perhaps expect a certain degree of relationship among them and such appears to be the case. As already pointed out *glauca* and *spinosa* are closely related while *fruticosa* may be regarded as a near relative; *digitata*, and *Wilmsii* on the other hand, are even more closely related to each other. The writer regards the latter as having been evolved from the variable *digitata*.

Gummifera and *repanda* have (like *glauca* and *spinosa*) no glands and in addition they lack coronae and have simple leaves; *gummifera*, a widely distributed species in Africa, and *hastata* and *repanda* are not clearly related to each other or to any of the other species.

The classification of the majority of species presented little difficulty but as a result of leaf heterophylly in one species, however, the work was much delayed, the complexity of the problem being increased by dioecism and floral polymorphism. The classification of the *senensis-digitata* material has resulted in more than 2 years delay in the completion of this study. Early in this work it became evident that leaf variability (heterophylly) within the *senensis-digitata* group has been responsible for the founding of a few additional species. To obtain the necessary proof for this view, has involved a good deal of time. This view is being illustrated by means of Plates 16-36 in conjunction with Plates 8-15 showing photos of type specimens of the species which were sunk. Moreover, further delay occurred when the South African material of *senensis-digitata* was forwarded to Kew for comparison, although, unfortunately, this procedure has been of little or no assistance.

Attention is here directed to the fact that amongst the material which the writer classifies under *A. digitata* a number of specimens have rather large fruits and may therefore represent a distinct group which appears to grow only in a certain area, approximately

defined by the Pretoria-Rustenburg districts. It is not unlikely that in future evidence may become available that would justify the separation of such large-fruited plants as a distinct variety (or perhaps species). However, such classification should be based on at least another character not associated with the fruit as otherwise male plants (and non-fruited female plants) from the same area, cannot be satisfactorily classified or will have to be classified with the species. Even if at this stage one were to favour separation of large-fruited specimens as a distinct group (variety or species) such a procedure would be impossible on account of this very difficulty, because there is as yet no means of separating male or non-fruited female plants. As a result of dioecism and floral polymorphism field studies would be necessary. Herbarium material is usually wanting in either fruit or flowers.

It should be mentioned that giant cells ("Gerbstoffbehälter") have not been observed on the Pretoria-Rustenburg specimens but, as pointed out, the distribution of this character is so variable and erratic that too much significance should perhaps not be attached thereto. Another character which would perhaps assist the elucidation of this problem is fruit colour.

A NOTE ON *A. multiflora* POTTS

This species was described from the growth made from an "enormous tuber" (61 cm. diameter and 30 cm. high) collected at Baviaanspoort, near Pretoria, by Dr. J. M. Fehrson in September, 1913. The description was based on material obtained from growth made "in a very sunny spot on the windowsill in the herbarium" (Transvaal Museum). The "tuber" was presumably not in soil and flowered first in February, 1914. "It never got a drop of water and again in October of the same year it made long shoots and flowered profusely as can be seen by the photograph taken at that time." Somewhat abnormal growth might be expected under such conditions and the present writer suggests that the numerous and small flowers as well as the unusually narrow lobed leaves (and the absence of tendrils too) that the "type" specimen showed was probably due to this or perhaps to the wrong season in which the plant first flowered. The multiflowered character is not unusual in *A. digitata*.

The "tuber" is stated to grow partly above ground and to have had a "grey leathery skin . . . green beneath". This character in itself was at first considered by the writer to be sufficiently distinct to justify a distinct species from *A. digitata* but on further study of photograph and type material in comparison with *A. digitata*, he observed a strong resemblance between the two and thereupon made another attempt to obtain material from the type locality, several previous visits having been unsuccessful. He was fortunate to locate two *Adenia* plants under a tree of *Acacia caffra*. They were growing side by side and their branches and leaves were dry but in the latter case both were of the *A. digitata* type. The two tubers were dug up and the one was completely underground and resembled a typical *A. digitata* tuber. The other one, partly above ground, was found to be growing immediately above a large root of the *Acacia* tree and had produced two separate "tap-roots" on either side of the root on which it was, so to speak, sitting astride, Plate 7. This obstruction possibly accounts for its appearance above the surface of the ground where the exposed surface was grayish but green just beneath, as described for *A. multiflora*.

The accompanying photograph shows the two "tubers". This, the writer contends proves that the appearance of the "tuber" above the surface of the ground is not due to a hereditary factor, but to environment. Whether subterranean obstruction is the only cause of this behaviour is doubtful for in the poisonous plant garden at the Onderstepoort Veterinary Research Laboratory, two plants of *A. digitata*, the tubers of which were originally "planted beneath the surface", have appeared above the surface and are said to be rising steadily.

ACKNOWLEDGMENTS.

The writer wishes to thank the Chief, Division of Plant Industry, Department of Agriculture and Forestry, for the facilities which enabled him to carry out this study. To Dr. E. P. Phillips, Principal Botanist, he is greatly indebted for interest and guidance.

Dr. H. G. Schweickhardt, Botanist for the Division of Plant Industry at Kew, has rendered valuable assistance in connection with the literature, the examination of type specimens both at Kew and Berlin, the examination and comparison with Kew material of some 100 sheets of the two closely-related species, *digitata* and *senensis*. He spared neither trouble nor time to obtain the desired information and I therefore make grateful acknowledgment to him.

My thanks are also due to the Curator of the Bolus Herbarium, the directors of the Capetown Museum, Albany Museum and Transvaal Museum, as well as to the Professor of Botany, Witwatersrand University and the Mycologist in Charge of the Natal Herbarium for the loan of specimens. Mr. W. G. Barnard, Stock Inspector in Sekukuniland has, on request, forwarded a range of very useful material for which I wish to thank him very much.

KEY TO THE IDENTIFICATION OF THE SPECIES.

- | | |
|--|----------------------|
| 1. Plants with well-developed thorns; leaves simple..... | <i>A. spinosa.</i> |
| Plants without thorns (rarely with weak thorns in <i>A. fruticosa</i> but then leaves lobed) | 2 |
| 2. Leaves simple or not digitately compound..... | 3 |
| Leaves digitately compound..... | 5 |
| 3. Leaves at least 3 times as long as broad..... | <i>A. repanda.</i> |
| Leaves not more than 1.5 times as long as broad or leaves broader than long..... | 4 |
| 7. Leaves and flowers punctulate..... | <i>A. gummifera.</i> |
| Leaves and flowers not punctulate..... | <i>A. hastata.</i> |
| 5. Leaves palmately 7-lobed (very rarely 5-lobed) tendrils absent..... | <i>A. Wilmsii.</i> |
| Leaves palmately 3- to 5-lobed, tendrils present..... | 6 |
| 6. Leaf-lobes more or less orbicular or somewhat broader than long; fruits variegated | <i>A. fruticosa.</i> |
| Leaf-lobes at least twice as long as broad; fruits not variegated..... | 7 |
| 7. Leaf-lobes broadly elliptic or elliptic oblong very glaucous, entire, conduplicate;
petals arising in sinuses of the lobes. "Tuber" always partly above ground... | <i>A. glauca.</i> |
| Leaf-lobes lanceolate or lanceolate-ovate, not strikingly glaucous, not conduplicate;
petals arising near the base of the calyx tube. "Tubers" very rarely above
ground..... | <i>A. digitata.</i> |

DESCRIPTION OF THE SPECIES.

Where possible the sex of the specimen has been indicated as well as the herbarium in which the specimens may be found.

A.—Albany Museum Herbarium, Grahamstown.

B.—Bulus Herbarium, Capetown.

C.—Natal Herbarium, Durban.

N.—National Herbarium, Pretoria.

S.—South African Museum Herbarium, Capetown.

T.—Transvaal Museum Herbarium, Pretoria.

W.—Witwatersrand University Herbarium, Johannesburg.

All specimens quoted were seen by the writer.

1. **A. spinosa** Burt Davy. *Man. Fl. Pl. and Ferns*. Pt. 1, 36, 221, 222.

Main (swollen) axis, irregular, tuberlike, variously shaped, fleshy, partly or mostly above ground, the latter green always growing in breadth, up to over 2 metres diameter (Bremekamp 3). *Branches*, numerous, "divaricate", arising from attenuations of the main stem; branchlets virgate, striate, glabrous, armed with spines; spines terete spreading, fairly stout or slender, 1–3 cm. apart, 1.2–4 cm. long, glaucous, resembling the branches or brownish, or the cortex thickened towards the base or in patches or from near the base upwards, with a straight or curved point or ending in a short tendril, with or without "toothlike" prominences or inflorescences near or at the base. *Leaves* simple, entire, sessile or shortly petioled, 1.5–3.2 cm. long, 1–2.3 cm. broad; oblong-ovate, retuse or emarginate or rounded at the apex, cordate or rounded at the base; glands absent on surface, two glands at the apex of the petiole and another smaller one at the apex of midrib below; petiole subsessile to 7 mm. long; stipules minute, toothlike from a broad base, reddish brown. *Inflorescence* short or very reduced, in axils of the spines or clustered at the base of spines; "cymes" 1-few-flowered; peduncles usually very abbreviated, terminating in pedicels or spines. *Male flowers* about 1.8 cm. long, yellowish. *Receptacle* scarcely 3 mm. long. *Calyx-tube* obconical, one-third the length of the lobes; lobes spreading, linear-oblong, entire, obtuse. *Petals* about two-thirds as long as the calyx-lobes, arising from their sinuses but appearing to be also partly inserted on the tissue joining calyx-tube to the staminal-tube, membranous, transparent, 1-nerved, linear, acuminate, narrowing below, suberrate or subundulate near the apices. *Corona* of slender processes, 0.5–1.0 mm. long, arising around the bases of the petals, partly or largely from the tissues joining staminal-tube to calyx-tube. *Stamens* much overtopped by the petals, extending to the middle of the calyx-lobes; filaments connate for half their length at the base, adnate to the calyx-tube at 5 points, forming 5 shallow narrow pockets: anthers linear or oblong; connective not produced into a point. *Glands* 0. *Ovary* rudimentary, small. *Female flowers* not seen. *Fruit* yellowish, about 2 cm. long, ovoid; pericarp leathery-papery, ? usually indehiscent.

TRANSVAAL.—Zoutpansberg district: Messina, September 1918, *Rogers* in T. 24000, ♀. Messina, *Rogers* 19299, ♀ (N). Messina 2,000 ft., September 1918, *Rogers* 21664, ♂ and ♀ (N). Messina, *Rogers* 19341, ♀ (N). Near Messina, base of kopje above the river Limpopo near the gorge, shrub w. elephantsfootlike base 27.5.27, *Young* in Herb. Moss. 14672, ♂, and T. 26933. On farm "Zoutpan No. 193", very characteristic of northern slopes of Zoutpansberg, main stem tuberous, about 1 ft. high and 2½ ft. broad at the base, Novem. 1932, *Öbermeyer*, *Schweickerdt* and *Verdoorn* 137 (N & T), 2 sheets of each. North of Fogwells, 21.12.35, *Smuts* and *Gillett* 3114 (N). Pietersburg district: At Naauwpoort, 29.1.31, *Bremekamp* and *Schweickerdt* 469, ♂ (N & T).

2. *A. repanda* (Burch.)* Engl. Bot. Jahrb. XIV 375.

Main axis a tuberlike topshaped—napiform root with a stem formed from accumulated remains of annual growths, subterranean ? or partly exposed. *Stem* woody, up to about 20 cm. high and 8 mm. thick, greyish brown. *Branches* straggling, ? or climbing, striate, grayish or purplish gray, glaucous, about 4 mm. thick at base, up to 120 cm. long, arising from the main stem or directly from the rootstock; branchlets absent. *Leaves* subsessile or shortly petioled, semi-conduplicate, 6–13 cm. long, 0.5–2 cm. broad, simple, subentire, remotely repand or short-lobed, with thinly cartilagenous green or reddish margins; linear-lanceolate or elongate-elliptic, obtuse, reticulated; glands on underside of leaf, below each marginal inequality (or lobe), below the apex at the end of the midrib and 2 at base of leaf on each side of apex of the petiole; petiole up to about 5 mm. long; stipules brownish, acicular, 1–1.5 mm. long. *Inflorescence* usually small, axillary, characteristically 2- to few-flowered; peduncle usually with alternate sidebranches, generally 1 sidebranch develops, occasionally both rudimentary; peduncle ending in tendril or pedicel; flowers usually dioecious, † “yellowish”, “dirty yellow” or “ochraceous”, or “greenish”. *Male flowers* about 2 cm. long. *Receptacle* usually about 3–4 mm. long, narrowly cylindric, slightly widening upwards. *Calyx* obconically tubular, the limb half or slightly less the length of the tube; lobes spreading, ovate to ovate-oblong to subovate to elliptic oblong, obtuse or subobtuse, entire. *Petals* inserted a little below the sinuses of the calyx-lobes or occasionally towards the middle of the calyx-tube, membranous, transparent, 1-nerved or with branched palmate veins, narrowly oblong or elliptic-oblong, acute to subobtuse, entire. *Corona* 0. *Stamens* free, inserted usually at about the middle of the calyx-tube, rarely lower, about equalling the petals in length; filaments, subulate or linear-subulate, from half to as long as the length of the anthers; anthers broadly linear; connective not produced into a point. *Glands* 0. *Ovary* rudimentary, about 1 mm. in length. *Female flowers* “greenish”, just over 1 cm. long. *Receptacle* 1–2 mm. long, shortly funnel-shaped or sub-cylindric. *Calyx* reddish or greenish, subcampanulate; the limb slightly shorter than the tube; lobes oblong-ovate, obtuse, entire. *Petals* inserted more than halfway up the tube, extending to the sinuses of the calyx-lobes, transparent, membranous, 1-nerved, short, oblong or elliptic-oblong, acute or subacute, apices curved outwards, entire. *Corona* 0. *Staminodes* free or connate at the extreme base, inserted at the base of the calyx, subulate or subulate-linear, with apices curved, hooked or tipped with abortive anthers. *Glands* 0. *Ovary* stipitate, ovoid or ellipsoid-ovoid, smooth; style fairly long, 3-branched, with the branches widening, terminating in a fleshy-papillate surface forming the stigma; ovules few, arising either in lower half or in upper half of the ovary. *Fruit* bright or coral red, roundish to ovoid, roundly and shallowly 3-lobed, about 1.5–3 cm. long, leathery, dehiscent, splitting into 3 (or 4?) valves; seeds roundish-heartshaped, regularly pitted. *Paschanthus repandus* Burch. Trav. I, 543. *Modecca paschanthus* Harv. Flora Cap. 11, p. 500. *Jaggia repanda* Schinz.‡ Verh. bot. Ver. Prov. Brand. 1888, 254. Fig. in Engl. Pflanzenwelt Afrikas IX. Bd. 111, Heft 2, 601. *Paschanthus Jaggii* Schinz.§

* The present writer is inclined to endorse the view of Schinz (l.c.) who thought that this species does not fit in well into *Adenia* as in several respects it differs from it, viz. absence of corona, hermaphroditism, non-connate stamens absence of glands and insertion of the stamens. However, no critical attitude is justified as the writer has only studied a limited number of the species in the genus.

† Burchell described this species as having polygamous flowers. Schinz described *Jaggia*, which Harms places as synonymous with *Adenia*, as hermaphroditic, Harms gives for his sect. 1 *Paschanthus* (Burch.) Harms (*Jaggia*, Schinz): Flowers hermaphrodite, polygamous or dioecious. The present writer has not found polygamy or hermaphroditism of common occurrence.

‡ H. Schinz in Bull. Travaux de la Soc. Bot. Geneve XI (67) 1891 states, *P. repandus* Burch. (*Jaggia repanda* Schinz).

§ The publication in which this epithet appeared is not known. *Modecca repanda* Druce. Rep. Bot. Exch. Club, Brit. Isles 1916, 636, is given as a syn. in Kew Index, but the author has not seen this publication.

TRANSVAAL.—Zoutpansberg district: Vivo, 20.1.31, *Bremekamp* and *Schweickerdt* 206, ♂ (N & T). Near farm Chapudi between Zoutpan and Waterpoort, branches flexuous not climbing, leaves markedly glaucous, scattered specimens seen 26.11.32, *Obermeyer*, *Schweickerdt* and *Verdoorn* 246, ♀ (N & T). Botanical Reserve, Messina, 18.12.28, *Pole Evans* 2, ♀ (N), (2 sheets).

CAPE PROVINCE.—Barkly West district: At Motito, Febr. 1842, *Burchell* 2486/2, ♂, type (N). Windsorton 1150 M., Jan. 1910, *Marloth* 5840, ♂ & ♂ (N). Prieska district: Without precise locality rocky hillsides, greedily eaten by stock, 26.11.28 and 3.12.35 *Bryant* 345, ♀ (N).

BECHUANALAND.—Near Kuruman, Ga Mhani Mts. 1350 M, Febr. 1886, *Marloth* 1092, ♂ (N), 2 specimens.

SOUTH WEST AFRICA.—Windhoek, Nov. 1924, *Rogers* 29798, ♂ & ♀ (N & S). Ditto, *Rogers* 29723 and 29784 (T & S). Great Karasberg, Narudas Süd, middle slopes, straggling among rocks fairly common, Dec. 1912/Jan. 1913, *Pearson* 8166, ♂ & ♀ (N, C, & S). Okahandja, niedrige Acacienbuschsteppe, 27.1.07, *Dinter* 362, ♀ (S). Windhoek, Glimmerschieferberge, Dec. 1912, *Dinter* 4516, ♀. Waterberg: Quickborn, under thorn trees, Apr. 1929, *Bradfield* 75, ♀ (N). Near Karibib, 24.12.29, *Moss* 17893, ♀ (W). hills S.W. Gründorn, erect 2-3 ft., in partial shade, *Pearson* 4276 (N).

3. *A. gummifera* (Harv.) Harms. Natürl. Pflanzenfam. Nachtrag 1. 255.*

Main stem woody, cylindric, greyish, up to 7.5 cm. in diam., the nodes enlarging with age, climbing to tops of large forest trees ("liana"), profusely branched. *Branches* green, striate, climbing in the canopies of trees, very glaucous; branchlets often numerous. *Leaves* petioled, 4-3-10 cm. wide and 4-8-8 cm. long, varying from kidney-shaped to deeply 3-lobed: lobes usually shallow, rounded, entire, the median one oblong, triangular or broadly oblong-ovate, bases variously cordate, subtruncate or variously rounded; sinuses wide; undersurface paler, visibly net-veined, punctulate (gland dotted) on one or both surfaces: dots dense or scattered, same colour as leaf surface or black; glands, ? rarely present on under surface of leaf, solitary at the apex of the petiole; petiole 3.5-9 cm. long; stipules minute, scale-like or a scaly ridge, usually shrivelling away with age. *Inflorescence* usually fairly open (not reduced), 2-many-flowered; sidebranches of peduncle usually alternate, sometimes one or both undeveloped: peduncles of primary inflorescences 2-14 cm. long, usually terminating in a tendril, sometimes in a long pedicel; flowers "green" "cream", "yellowish". *Male flowers* about 1.5 cm. long. *Receptacle* 3-5 mm. long, narrowly subcylindric, abruptly widening at upper end or subfunnel-shaped or obconical. *Calyx-tube* under 2.5 mm. long, saucer-shaped or ring-shaped, one-third to one-fifth the length of the limb; lobes spreading, linear or narrowly oblong-ovate or oblong-elliptic or linear-ovate or oblong or subspathulate, obtuse to subacute, entire or slightly uneven at apices, faintly striped-splashed and remotely black-dotted (punctulate). *Petals* inserted at the sinuses of the calyx-tubes, resembling these and equalling them in length, or shorter or slightly longer, linear-oblongate, subspathulate, oblongate or linear or elliptic-oblong, more transparent and less punctulate than the calyx-lobes, crenate-dentate, uneven near the apices, acute to obtuse. *Corona* 0. *Stamens* arising from the centre of the receptacle, extending to beyond the middle of the calyx-lobes or nearly to their apices; free portions of filaments shortly subulate or linear-subulate, connate for almost half (or slightly more)

* There is apparently a good deal of confusion as regards the relation between this species and *A. cissampeloides* (Planch) Harms. some regarding them as identical. Masters divides them, it would appear, as an Eastern and Western species and describes both as having the sepals inserted at the base of the calyx which definitely is not the case in the S.A. plant which invariably has the petals arising in the sinuses of the calyx-lobes and correctly described by Harvey in Fl. Cap. vol. 2, p. 500. Dr. H. G. Schweickerdt writing from Kew (Jan. 6, 1937) states: "*A. gummifera* (Harv.) Harms and *A. cissampeloides* (Planch) Harms are two good distinct species. I first believed them to be conspecific, but now am quite convinced that they are distinct; the venation differs."

their length at the base or almost free; anthers, linear, or linear-oblong, densely and minutely reddish-brown spotted; connective ? usually "dotted" (punctulate). Glands 0. Ovary rudimentary, minute or overtopping the staminal tube. Female flowers about 5-6 mm. long or slightly longer. Receptacle minute, 1 mm. and under. Calyx-tube absent or practically so; sepals spreading, linear-oblong, ovate or ovate-oblong, faintly-striped-splashed and remotely black-dotted (punctulate), obtuse to subacute, entire. Petals inserted at the sinuses of the sepals, about half the length of these or shorter, linear, under $\frac{1}{2}$ mm. wide, apices curved, transparent, with black "dots" few or absent. Corona 0. Staminodes short flat out-growths or toothlike, arising just at the base of the ovary stalk. Glands 0. Ovary sessile, or shortly stipitate, ovoid, smooth; style short or wanting; stigma of short reflexed lobes, arising abruptly from the narrowed apex of the ovary or as 3 expanded branches from a short style; ovules, several. Fruit "brownish-orange", up to 4 or 5 cm. long, ellipsoid, leathery, dehiscent, seed 4 mm. long somewhat flattened, subovate, regularly pitted. *Modecca gummifera* (Harv.) Harv. & Sond. Fl. Cap. II, 500. *Ophiocolon* (*M. ? gummifera*) Harv. Gen. S. Afr. Pl. Ed. 2, 121. *Ophiocolon gummifer* Mast. Oliv. Fl. Trop. Afr., II, 518. *Ophiocolon gummifera* (Harv. & Sond.) Mast. Nat. Pflanzenfam. Ed. I, III, ta., 83. *Adenia gummifera* Burt Davy Fl. Pl. and Ferns, Tvl., & Swaz. 1, 222, and in Ann. Transvaal Museum III, 121.

TRANSVAAL.—Nelspruit district: At Kaapmuiden, Febr. 1923, *Thorncroft* 1199, in T.M. No. 23140, ♂ (T). Just outside Nelspruit, 2,700 ft. 26.10.30, *Liebenberg* 2636, ♂ (N). Barberton district: Highland Creek, climbing over trees 10-20 ft. high, 4,000 ft., 29.1.90, *Galpin* 782. Zoutpansberg district: Farm "Elsteg", 5 miles west of Louis Trichardt, Nov. 1932, *Obermeyer*, *Schweickerdt* and *Verdoorn* 355, ♀ (N & T). At Elim, Dec. 1930, *Obermeyer* 819, ♀ (T). Pisangkop, Febr. 1878, *Nelson* in T. 11159, ♀. Pietersburg district: Modjadjies, *Rogers* 18110 (W). Politsi, Dec. 1932, *Schweickerdt* 1039, ♂ (N). Tshakoma, Nov. 1931, *Obermeyer* 1063 (T). Magoebaskloof, Jan. 1933, *Murray* 761 (N). Lydenburg district: Mariepskop, Nov. 1925, *Fitzsimons* and *van Dam* in T. 30631, ♂. Sekukuni Location, Kloof, Western Spur on farm Magnets Heights 4,500 ft., 24.10.34, *Barnard* 128, ♂ (N).

NATAL AND ZULULAND.—Durban, Doonside, Dec. 1933, *Wyllie* in C. 23313, ♂. Berea, 150 ft., Dec. 1894, *Wood* 5502, ♂ (N). Ditto, 17.1.98, *Wood* 6662, ♂ & ♀ (N). Farm Friedenau, Station Dumisa, 6.12.08, *Rudatis* 523, ♂. Without precise locality, *Gerrard* and *McKen* in C. 688, ♂. Pietermaritzburg: Umlalaas, 1.1.33, *Gerstner* in C. 22614.

CAPE PROVINCE.—In woods near Keimouth, 100 ft., Jan. 1892, *Flanagan* 1156, ♂ & ♀ (N). Port St. John, climbing over shrubs, 15 ft., Dec. 1896, *Galpin* 3461, ♀ (N). Umtata to Port St. Johns, Dec. 1927, *Blenkiron* in W. 16053. Kentani district: Valley, immense climbing plant, Jan. 1903, alt. 0, *Pegler* 869, ♂ (N).

4. *A. hastata* (Harv.) Schinz. Bot. Jahrb. XV. Beibl. 33, 3.

Root not known ? like in *A. digitata*. Main stem ? absent. Main branches herbaceous, annual straggling, procumbent or climbing, striate, greyish or dark, sometimes glaucous, up to 4 mm. thick at the base and "250 cm. long or more", ? arising from an underground ? tuberlike rootstock; branchlets usually absent. Leaves petioled, 3-8 cm. long and broad, simple, entire, variously cordate-ovate to hastate* (but the lateral lobes obtuse) with the median lobe lanceolate, acute or subobtuse: glands 2 (paired) at the apex of the petiole, variable, often 2 (paired) at the leaf apex, variable; petiole, 0.8-5.0 cm. long; stipules subulate and toothlike, 1.5-2.0 mm. long. Inflorescence axillary, varying much in size; peduncles usually terminating in tendrils, with sidebranches usually opposite and few-flowered. Male flowers 1.3-3.1 cm. long. Receptacle 3-8 mm. long, subcylindric, widening towards the apex, or obconical to subfunnel-shaped. Calyx tubular, widening upwards or

* Peltate-ovate leaves were typical of *Gerstner* 2345 but were not observed in any other specimens.

subcampanulate, with the limb one-third to one-half the length of the tube; lobes ovate to orbicular or oblong, obtuse or subacute, with the 5 interiorly overlapping margins lacinate-lacerate and the remaining 5 entire. *Petals* inserted below (just above the corona) at, or above the middle of the calyx-tube, transparent to subtransparent, 1-nerved or 3-veined, linear-lanceolate, narrowed at the base, entire to remotely serrate (or distantly narrow-lobed) or subentire or fimbriate-laciniate (filiform processes) for two-thirds or more of their length, with the processes varying in length and density. *Corona* a sinuate circle of filiform processes, arising from a little above the base of the calyx-tube in groups or in a continuous circle; processes 0.75–3 mm. long, scattered to very dense. *Stamens* arising from the centre of the receptacle extending to the sinuses of the lobes or well below; free portions of the filaments subulate-linear; connate for one-fourth to two-fifths their length at the base, forming a shallow cup adnate to the calyx-tube (at 5 points) forming 5 narrow pockets or depressions; anthers linear-oblong to linear, with the connective not produced into a point, equalling or up to 1.5 times the length of the free filaments. *Glands* 5, arising from the base of the pockets (or depressions), approximately 1.5 mm. long, hidden in or protruding from the pockets, flattened, capitate or subcapitate, shortly linear to shortly oblong or spatulate. *Ovary* subterete, protruding slightly above the staminal cup or extending beyond the apices of the filaments. *Female flowers*, 1.2–1.8 cm. long, "white" ? *Receptacle* 1.5–2.5 mm. long, stout, shortly funnel-shaped or subfunnel-shaped. *Calyx* campanulate or nearly so, narrowed at the base; tube twice as long as the limb; lobes ovate to orbicular-ovate to oblong-ovate, obtuse to subacute with the 5 interiorly overlapping margins lacinate to lacerate, the remaining entire. *Petals* inserted at about the middle of (or just below) the calyx-tube, extending to about the sinuses of the calyx-lobes, narrowly linear-acute or linear-acuminate, slightly curved at the apices or straight, entire or remotely dentate, narrowly lobed in the upper half. *Corona* a circle of filiform processes or fimbriately lobed processes; processes 0.75–1.75 mm. long, arising from near the base of the calyx-tube. *Staminodes* arising from the centre of the receptacle, bases connate, forming a collar around the stalk or ovary, adnate to the extreme base of the calyx-tube (? or receptacle) forming 5 pockets or depressions, linear-subulate, curved or bent near the apices. *Glands* arising from the side of the depressions very small or up to 1 mm. long, flattened, variously capitate, shortly oblong or subspathulate. *Ovary* stipitate, ovoid or spherical, smooth; style fairly long, 3-branched; branches palmately widened, terminating in a fleshy-papillate surface (stigma); ovules numerous. *Fruit* "as large as an egg" (Harvey), and smaller, "green and white", roundish "pulpy", leathery, ? dehiscent; seed flattened, ovate-orbicular, pitted. *Modecca hastata* Harv. Thes., Cap. 11, 43, pl. 167. *Adenia Schlechteri* Harms Engl. Bot. Jahrb. 33, 150. *Adenia hastata* Burt Davy Ann. Transv. Museum III, 121.

TRANSVAAL.—Nelspruit district: Komatipoort, *Rogers* (? 12606) in T. 13273. Ditto, Nov. 1931, 1,000–2,000 ft., *Rogers* 12606, ♂ (S, B & N). Komatipoort, 14.12.97, *Schlechter* 11747 (N). Nelspruit, Dec. 1917, *Breyer*, T. 17956, ♂. Karino, 28.1.29, *Hutt* in N. 7870, ♀. Near Nelspruit, 24.1.06, *Cronje* in N. 1489, ♀. Barberton district: Barberton, Nov. 1915, *Rogers* 18369, ♂ (S). Barberton, Nov. 1931, *Smith* 7006, ♂ (N). Barberton, Sept./Oct. 1889, 2,300–3,000 ft. procumbent, 3–4 ft. long, in stonyground on hillsides among rocks, *Galpin* 563, ♂ & ♀ (B. & N). Hills near Barberton, climber, 3,000 ft., Aug. 1923, *Thorncroft* 2034, ♂ (N). Barberton, Oct. 1922, *Wager* in T. 23675, ♂. Barberton, Nov. 1931, *Smith* 7069 (N). Ditto, *Thorncroft* in C. 5980, ♂ & ♀. Ditto, Nov. 1909, *Williams* in T. 7643, ♀. Ditto, Oct. 1907, *Thorncroft* in T. 3923, ♀. Kruger National Park: Skukuza, in shade of *Acacia*, among rocks on N. bank of Sabi R., *Letty* 43, ♀ (N). ? district: Witsteen, growing in Div. Pl. Ind. Garden, *Hutchinson*, ♂ (N).

NATAL.—Without precise locality (? near Greytown), 29.10.31, *Pole Evans* 3836, ♀ (N). Nongoma district: Mahlabatini, between diabase, 18.11.37, *Gerstner* 2345, ♂ (N). Middle Umkuzi, on Mr. Nagels farm, 10.1.36, *Gerstner* 2895 (N).

5. *Adenia Wilmsii* Harms. Engl. Bot. Jahrb. 26 : 238.

Root tuberlike, napiform or variously shaped, ? not rising above ground, up to 7 lbs. ? and over. *Main stem* ? always underground, an attenuated outgrowth from root or ? formed from accumulated remains of annual growths, woody. *Branches* herbaceous, annual, one or more from same rootstock or main stem, semi-erect or semi-procumbent up to 50 cm. and over. *Leaves* digitately compound, petioled ; lobes 7, occasionally 5, the median lobe often entire, but usually pinnati-lobed (1-2 pairs) at about the middle or below, 5-12 cm. long (? often less) ; the other lobes entire and simple, unequal in length ; glands absent on under-surface and usually also in the sinuses of the lobes ; petiole stout, usually long, 4-7 cm., with 2 large (occasionally 4) fleshy circular glands at the junction with the lobes, above ; stipules about 1-2 mm. long, toothlike. *Inflorescence* axillary ; peduncle stout, 4-5 cm. long, terminating in a normal flower ; main branches opposite or alternate, one or both sometimes rudimentary with the "terminal" flower (at the termination of the peduncle) ? always developed ; peduncle branches of normal stems 1-flowered, 2- to 3-flowered on reproductive shoots ; flowers yellowish. *Male flowers* about 2.5 cm. long. *Receptacle* 5-7 mm. long, linear, subcylindric widening upwards. *Calyx* salver-shaped or cylindric-campanulate ; tube cylindric or narrowly obconical, sometimes abruptly narrowed above the base, one and one-half to twice the length of lobes ; lobes ovate or oblong-ovate or subelliptic, obtuse or subobtuse, interior margins entire or subentire. *Petals* inserted a little below the middle of the calyx-tube, extending a little or well beyond the sinuses of the lobes, membranous, transparent, palmately 3- or 5-veined, with sideveins in the latter usually few-branched, oblanceolate or elliptic-oblanceolate, subserrate in upper $\frac{1}{2}$ or $\frac{1}{3}$, subobtuse. *Corona* of slender processes, 0.5-0.75 mm. long, arranged in a circle or sinuate ring just below the insertion of the petals. *Stamens* well overtopped by the petals, extending to just below the sinuses of the calyx-lobes, connate for half their length at the base ; filamental column adnate to the calyx-tube for $\frac{1}{2}$ or its full length producing 5 pockets ; anthers equal in length or longer than the free filaments, apiculate. *Glands* arising from the base of the pockets, flattened, capitate ; stems short or almost absent. *Ovary* rudimentary, extending half way up the filamental column or its entire length. *Female flowers* not seen.

TRANSVAAL.—Lydenburg district : On High School grounds in Lydenburg, Oct./Nov. 1935, *Van Wyk*, ♂ & ♀ (N). Without precise date and locality (? at Lydenburg), *van Wyk* (N). Lydenburg, 1935, *Pons*, ♂ (N). Farm Rooibraai, 1/8" long stems, red loam soil, 7.12.35, *Liebenberg* 3488 (N). Ditto, *Liebenberg* 3496 (N).

6. *A. fruticosa* Burt Davy Man. Fl. P. & Ferns Tvl. & Swaz. 1, 36.

Main (swollen) axis tuberlike, flask-shaped, trunklike, fleshy, smooth, partly or mostly above ground, the latter green, up to over 2 metres, branched or unbranched at the base, ending in whiplike branches (Bremekamp). *Branches* climbing, striate, greyish-green, glaucous ; branchlets present in axils of tendrils. *Leaves* compound, digitately 3-lobed, rarely 5-lobed, petioled ; lobes petioluled to subsessile, the median about 1.7-6.5 cm. long and about the same width, the lateral and basal smaller, simple, entire, rotund, orbicular or orbicular-obovate, subtruncate, retuse or rounded at the apex ; glands absent on all parts of the leaf including the sinuses of the lobes (? always) with 1 large subreniform subpeltate gland at the apex of the petiole ; petiole 1-5.0 cm. long ; stipules, minute, toothlike, $\frac{1}{2}$ mm. or less long ; tendrils sometimes strong or weak, sometimes breaking off giving the appearance of thorns. *Inflorescence* usually on axillary branchlets, in axils of leaves or tendrils, 1- to 3-flowered, usually alternate, sometimes one or both rudimentary ; peduncle wanting to 4 mm. long, terminating in a flower not a tendril ; tendrils without developed cymes, in axils of leaves, with or without bracts. *Male flowers* not seen, according to Burt Davy : *Sepals* imbricate (in bud about 8 mm. long). *Petals* free, membranaceous (about 1 cm. long and 2.5 mm. wide). *Stamens* 5-6, free ; filaments 2 mm. long ; anthers about

2.5 mm. long, laterally dehiscent. *Ovary* rudimentary, small. *Female flowers* "greenish", yellowish or "yellowish-green", about 8 mm. long. *Receptacle* subcylindric, 1 mm. long. *Calyx* subcampanulate; lobes semi-erect, 3-4 times as long as the tube, elliptic-oblong, obtuse, entire, with broad green longitudinal veins. *Petals* about $\frac{1}{2}$ the length of the calyx lobes or slightly longer, arising from the sinuses of the latter but appearing also to be partly inserted on the tissue joining calyx-tube to staminal column, membranous, transparent, with 1 broad green vein, ovate-lanceolate, tapering towards the base in lower third, serrate-uneven in upper half. *Corona* a circular lacerated fringe with slender-branched filiform processes about 0.5 mm. long arising from the edge of the calyx-tube and from the tissue joining staminal tube to calyx-tube. *Staminodes* connate for half their length at the base, forming a column around the base of the ovary stalk; staminal column joined to the calyx-tube at 5 points by means of fleshy membranous tissue, forming 5 pockets with the free ends subulate and apices curved. *Glands* broad, flattened, arising at the base of the "pockets". *Ovary* stipitate, spherical, smooth; style short, 3-branched; branches long, terminating in shield-like fleshy-papillate structures forming the stigma; ovules few. *Fruit* yellowish, longitudinally unevenly banded with green, approximately 2 cm. long, roundish, leathery, dehiscent, splitting into 3 valves; seeds flat, suborbicular, regularly pitted. Bremekamp in Vegetationsbilder 1932: 23, 3, pl. 18.

TRANSVAAL.—Pietersburg district: On slopes 2 miles beyond Chuniespoort Hotel, pale green succulent flask-shaped, stems up to 4-5 ft. high, lounging against *Peltophorum*, several branches ascending and climbing in the tree, May 1935, Obermeyer and Verdoorn 10 (N & T). M'Phatlele's Location, climbing plant with swollen stem, 9.10.19, *Pole Evans* in N. 19885, ♀. Zoutpansberg district: Dongola Reserve, Messina, 15.9.34, *Pole Evans* 3747, ♀ (N). Lydenburg district: Sekukuni, farm Driekop, dry sandy loam, 3,500 ft., 17.12.36, *Barnard* 454b (N). Ditto, between crevices on "koppies", bole attains size of a 56-gal. barrel, 4 ft. high, 13.1.36, *Barnard* 454 (N).

7. **A. glauca** Schinz Bot. Jahrb. XV. Beibl. 33 Heft 1, 1-3.

Main (swollen) axis tuberlike, "urn-shaped" or irregular-shaped, fleshy, partly or, mostly above ground, the latter greyish, green beneath the skin, of various shapes and* sizes, up to 2 ft. (or more?) high. *Branches*? divaricate, striate, glaucous, up to 5 mm. thick and about 150 cm. long, arising from attenuations of the main stem or directly from a flat surface; branchlets? usually few or absent, rarely well developed, resembling the branches but greener, glaucous. *Leaves* digitately compound, petioled; lobes 5, occasionally sub-petioluled, conduplicate, 1.5-6 cm. long, entire, with the margins thinly cartilagenous, elliptic, sub-orbicular, rotund or obovate, gradually or abruptly narrowed at the base, obtuse; glands absent on all parts of the leaf including sinuses of lobes, with 2-paired flaplike glands† at the base of the leaf; petiole 0.6-5 cm. long; stipules minute, toothlike, dark reddish-brown. *Inflorescence* usually axillary, peduncles opposite or alternate with 1- to 2-flowered sidebranches, occasionally many-flowered; peduncles usually terminating in tendrils, not infrequently in shorter or longer flower-bearing pedicels. *Male flowers* yellowish, about 3 cm. long. *Receptacle* 1.1-3.5 cm. long, usually about 1 cm. long, linear-subcylindric, gradually widening towards the apex. *Calyx-tube* obconical or subobconical, $\frac{2}{3}$ - $\frac{1}{2}$ the length of the lobes; lobes semi-spreading, linear-oblong, sometimes broadening towards the apex to linear, or elliptic-oblong, obtuse or subobtuse, entire. *Petals* more than half the length of the calyx-lobes, arising from the sinuses of the calyx-lobes but appearing also to be partly inserted on the tissue joining staminal cup (tube) to calyx-tube, membranous, transparent, 1-nerved or palmately 3-veined, the median vein unbranched or remotely branched or branches absent with occasional stray veins, narrowly oblong-elliptic or linear-lanceolate tapering towards the base or ovate-lanceolate or lanceolate at both ends, acute to obtuse with curved or straight apices and margins remotely or unevenly

* Sometimes with "neckline" protuberances from which the branches arise. (Smith 6271.)

† Schinz (l.c.) refers to 1, 2 or 3 glands "oberhalb der Achselprodukt" but the writer has found only bracts enveloping a bud.

serrate or dentate in the upper third or two-thirds. *Corona* of a few filiform processes, about 0.5 mm. long (very rarely 1.5 mm. long), arising from around the base of the petals partly or entirely from the edge of the tissue joining staminal cup to calyx-tube. *Stamens* much overtopped by the petals, extending about half way up the calyx-lobes, free portions of filaments subulate or linear-subulate, of varying length, connective produced into a point, connate for half to two-thirds their length at the base forming an obconical cup adnate to the calyx-tube at 5 points producing 5 narrow pockets; anthers short, broad, or linear oblong, equalling the free filaments in length or occasionally up to 4 or 5 times their length. *Glands* 0. *Ovary* rudimentary, 2 mm. long. *Female flowers* yellowish, about 1.4 cm. long. *Receptacle* approximately 2.4 mm. long, shortly funnel-shaped or narrowly subcylindric. *Calyx-tube* subcylindric to cup-shaped, one-third to one-fifth the length of the lobes; lobes semi-spreading or subspathulate or obovate or oblong or linear, elliptic-oblong, obtuse to sub-obtuse, entire. *Petals* about half the length of the calyx-lobes, arising from the sinuses of the latter but appearing also to be partly inserted on the tissue joining calyx-tube to staminal tube, membranous, transparent, 1-veined, with sometimes remote branches or an occasional stray vein, oblanceolate to linear-elliptic to lanceolate in upper one-third to one-half, gradually tapering towards the base, acute to truncate-toothed, with curved or straight apices and margins subentire or remotely serrate-uneven in upper parts. *Corona* of a few filiform processes about 5 mm. long, arising from around the base of the petals, partly or entirely from the edge of the tissue joining staminal tube (cup) to calyx tube. *Staminodes* connate for half or more of their length at the base to form a wide tube or collar around the ovary stalk; adnate to the calyx-tube at 5 points forming 5 narrow pockets with the free filaments subulate-tapering, sharply curved at the apices or with rudimentary anthers. *Glands* 0. *Ovary* stipitate, ovoid to orbicular, or rarely somewhat 4-sided, smooth or with transverse raised bands; style short, 3-branched, * the branches widening upwards terminating in a papillate-fleshy stigma; ovules? few. *Fruit*? orange to yellow-coloured, roundish to ovoid, roundly and shallowly 3 (-4) lobed, leathery, ? usually dehiscent, splitting into 3 (4) valves. *Seeds* flat, roundish-heartshaped, regularly pitted. *Modecca glauca*, Schinz. Bot. Jahrb. XV. Beiblatt 33, I.

TRANSVAAL.—Waterberg district: Warmbaths, 8.12.04, *Burt Davy* 2622, ♀ (N & B). Near Pienaars River, 52 miles west of Warmbaths on hills, Sept. 1932, *Smuts* 355, ♀ (N). Vierentwintig Riviere, Jan. 1920, *Rogers* in T. 20816. Vygeboompoort, Sept. 1913, *van Dam* in T. 13191. Ditto. Oct. 1913, in T. 13715, ♀. Farm Roodepoort No. 15, Palala Rd., rocky ridge, large epigeal tuber with 18" stems, 6.12.31, *Galpin* 11606, ♀ (N & B). Farm Doornfontein No. 1807, amongst felsite rocks, fleshy stem 1½ ft. high and 6" diameter, 19.2.24, *Galpin* 9164 (N). Olifants Poort, 9 miles N.E. of Nylstroom, climbing up stem, of trees, on hillside, 6.12.34, *Galpin* 13195 (N).† Potgietersrust district: Farm Nooitgedacht near Naboomspruit, amongst rocks on mountain top, stems trailing from large epigeal tuber, 18.10.31, *Galpin* 11605, ♀ (N). Potgietersrust, June 1916, *Rogers* 18827, ♂ (N & B). Kwarriehoek School, everywhere, particularly between rocks and extended rock outcrops, *Steyn* 37, ♂ (N). On Temby Downs, epigeal portion of tuber conical 15" high, malachite green, stems slender climbing 10 ft. up tree stems, 2,900 ft., 18.11.34, *Galpin* 13197, ♀ (N). Pretoria district: On summit of Daspoort range near Fairy Glen, 4,700 ft., 6.10.33, *Mogg* 14130, ♂ (N). Wonderboom, Mar. 1924, *van Dam* in T. 25042. Premier Mine, Aug. 1924, *Verdoorn* (N). Ditto, Dec. 1919, *Rogers* 25027 (T). Ditto, 4,000 ft., *Meuzies*. Flats beyond Silverton, 12.10.19, *Phillips* 3021, ♀ (N). Derdepoort, 7.10.28, *Mogg* 15386, ♂ & ♀ (N). Magaliesberg, May 1920, *Marloth* 9508, ♂ (N). Foot of Magaliesberg on farm "Grafheim", 4 miles west of Wonderboom Poort, growing on rocky but loose

* In *Smuts* 355 there were 4 style branches and 4 placentae on the flowers examined.

† On farm "Grafenheim" along lower N. slopes of the Magaliesberg growing under *Ehretia rigida* bush in shady places and widely climbing among the branches of its support, rootstock a large tuber of globose to obovoid shape and partly buried in the loose black sandy soil . . . the exposed part often acquiring a highly polished surface, being thus very shiny and green . . . "vern. name 'Bobbejaan'", Oct. 1933, *Smith* 6841 ♂ (N).

sandy soil, stems up to 4 ft. with 2 or 3 necklike protuberances from which the stems arise, up to 50 lb. in weight, stems sprawling over other plants such as *Ochna pulchra* and *Burkea africana*, 31.7.32 C., 4,200 ft., *Smith* 6271, ♂ (N).^{*} Without precise locality, growing in Stellenbosch University Garden, Oct. 1928, *Marloth* in N. 16416, ♀. Ditto, Div. Pl. Ind. Gardens, *Verdoorn* (N). Ditto, from Onderstepoort poisonous plant garden, Nov. 1934, *Liebenberg* 3222, ♀ (N). Ditto, 1932, *Steyn* AS; 9.11.32.

8. *Adenia digitata* (Harv.) Engl. Bot. Jahrb. XIV. 375.

Root tuberlike, subnapiform or variously shaped, appearing above ground (green) with subterranean obstruction, up to about 30 lb. ? and over. *Main stem* usually underground, from accumulated remains of annual growths, usually under 20 cm. long, and 15.0 mm. thick, woody. *Branches* herbaceous, annual, striate, climbing, up to 180 cms. long and ? more, and about 6.0 mm. thick, usually arising singly from a tuber. *Leaves* digitately compound, petioled; lobes usually 5, occasionally 3, (sub) or pinnatilobed or pinnatisect sometimes petioluled or simple, narrowly linear or linear lanceolate or ovate or elliptic-lanceolate, entire, unequal in length; central lobes 2.0 (? 1.5†)—16 cm. long; glands on lower surface circular or slightly oblong, usually present at all sinuses of primary lobes and of the lowermost secondary lobes of the primary central lobe, sometimes present at all sinuses of lower secondary lobes, occasionally absent in some of the sinuses of primary lobes or on the lower surfaces of simple lobes; petiole 0.5–7.5 cm. long with 2 paired glands above, at the apex; stipules minute toothlike, rarely up to 3 mm. *Inflorescence* axillary, two primary branches opposite or alternate, often 1-few-flowered, usually 4–8 flowered, rarely many flowered (18–20‡); peduncles absent or almost so, to 6.5 cms. long, always ending in tendrils; flowers whitish, bright-greenish, pink tinted or creamy or yellowish. *Male flowers* 1.5–3.5 cm. long. *Receptacle* 3–9.5 mm. long, linear-subcylindric, widening upwards or funnelshaped. *Calyx* subcampanulate or campanulate; tube subcylindric widening upwards or obconical sometimes with a slight constriction just above the base, equal in length to the lobes or up to 3 times their length; lobes elliptic-ovate or oblong-ovate or broadly ovate (or-bicular-ovate) or oblong ovate; obtuse to subacute, interior margins lacerate-laciniate, very rarely entire or subentire. *Petals* inserted near the base of the calyx tube, rarely near the middle thereof, extending to the sinuses of the calyx lobes or a little below or well above; membranous, transparent, palmately 3-veined with the sideveins entire or few-branched; oblanceolate-acuminate, oblanceolate or linear-oblanceolate or broadly oblanceolate or elliptic-ovate with narrowed bases or lanceolate in upper half, cuneate-tapering in lower half; acute to obtuse, upper $\frac{2}{3}$ or $\frac{1}{3}$ serrate or serrulate or denticulate (dentate)—laciniate or serrate-denticulate, rarely entire or subentire. *Corona* sometimes absent or nearly so, of slender processes 0.5–0.75 mm. long, rarely over 1 mm.; arising in a continuous sinuate ring rarely in groups from between the bases of the petals, sometimes subpapillate at the upper ends. *Stamens* usually overtopped by the calyx tube and petals, extending below or beyond the sinuses of the calyx lobes, connate for half their length, rarely up to $\frac{2}{3}$ their length; the filamental column adnate to the calyx tube in its lower half very rarely only at the base or for its full length, producing 5 pockets; anthers shorter or longer than the filaments, apiculate, loosely adhering at these points. *Glands* usually about 0.5–0.75 mm. long, arising from the base of the "pockets", flattened, capitate, variously shaped. *Female flowers* 1.5–2.5 cm. long. *Receptacle* 2–6.5 mm. long, subcylindric widening upwards or funnelshaped, sometimes also widened at the base. *Calyx* campanulate; tube obconical or subcylindric widening upwards, as long as the lobes or up to double their length; lobes ovate or broadly oblong-ovate, or narrowly oblong or

* Without precise locality, Waterberg dist. vine w. large thick tuberous rootstock, 9.11.28. *Repton* 96 ♀ (N).

† Some flowering specimens have central lobes 1.5 cm. long, though it is not known whether they are full grown. In the Fehrson specimens (type of *A. multiflora* Pott.) the leaves are much shorter.

‡ In *Eyles* 3243 in Herb. Bolus (from Rhodesia), Fig. 15, the inflorescence is approximately 40-flowered.

broadly lanceolate, acute to obtuse with interior margins entire, very rarely subentire. *Petals* inserted near the middle or near the base of the calyx tube, extending to the sinuses of the lobes or below or above; membranous, transparent, 1 veined, very rarely 3-veined, oblanceolate or lanceolate to ovate-lanceolate in upper $\frac{1}{2}$ with lower $\frac{1}{2}$ gradually tapering towards the base, linear-lanceolate, narrowed at the base, or linear-oblanceolate or narrowly elliptic, entire, sometimes remotely toothed towards the apices, very rarely lacinate in upper $\frac{1}{2}$ or $\frac{1}{3}$; acute to subobtuse or acuminate. *Corona* rarely absent or nearly so, of slender appendages about 0.5–0.75 mm. or less long, arising in groups in a circle or in a sinuate ring from near the base of the calyx tube or higher, sometimes subpapillate at their upper ends. *Staminodes* partly connate, the free portions linear-subulate or subulate, or linear-sub-spathulate, as long or longer than the rest, curving outwards and inwards or vice versa, with apices incurved, shorter, as long as or longer than the ovary stalk; the staminal collar adnate for a short distance or more of its length to the calyx tube forming 5 pockets or depressions. *Glands* flattened, capitate, variously shaped; stems erect, rarely recurved, short and broad or long, heads usually large, concave or level above, rarely bilobed. *Ovary* stipitate, ovate to obicular or oblong or ellipsoid, smooth or prominently veined, rarely furrowed or ridged or uneven; style 3-branched, very rarely 2-branched, the unbranched portion up to $\frac{2}{3}$ the length of the ovary or almost absent; stigma pufflike, woolly fleshy; ovules numerous. *Fruit* "orange" "brilliant orange", "yellow"? "crimson", "red-purplish" ovoid-oblong or ellipsoid, 3-valved, dehiscent; seeds flattened, roundish-subpear-shaped, regularly pitted. *Adenia senensis* (Kl.) Engl. *Bot. Jahrb.* 14 (1892), 375. *Adenia digitata* Burtl. *Davy Ann. Transv. Mus.* 111. 121.—*Modecca digitata* Harr. *Thes. Cap.* p. 8. *A. multiflora* Potts *Ann. Transv. Mus.* V. 235. *Clemanthus senensis* Klotsch, *Peters Reise Mosamb. Bot.* 143. *Modecca senensis* Mast. *Oliv. Fl. Trop. Afr.* 11, 517. *Adenia angustisecta** Burtl. *Davy. Kew. Bull.* 1921. 280. *Adenia stenophylla* Harms. *Eng. Bot. Jahrb.* XXVI, 238. *Adenia Buchananii* Harms. ex Engler in *Engl. Pflanzenw. Afr.* 111, 2. (Engl. and Drude *Veg. d. Erde* IX) 605, (1921) in obs.

TRANSVAAL.—Pretoria district: Middelkop farm near Pienaars River, C. 3680 fts Jan. 1926, *Smith* 2120, ♀ (N). Hartbeestpoort, *Jackson*, ♀ (N). Rooikop, 5.1.36, *Smut. and Gillett* 3450, ♀ (N). Pienaars River Station, Oct. 1932, *Osborne* in N. 2639, ♂ (2 sheets). Without precise locality, 23.1.23, *Osborne* in N. Rust-der-Winter, Jan. 1936, *Pole Evans* 3886, ♀ (N). Strubenskop, 18.1.36, *Munro* in N, ♀. Farm Zeekoegat, Swingbridge, 27.1.34, *Schweickerdt* 1090, ♀ (N). Bon Accord, W. Pyramid Hill, 12 M. north of Pretoria, 4,200 ft., 6.4.32, *Mogg* 12388, ♀ (N). From Onderstepoort Poisonous Plant garden Nov. 1934, *Liebenberg* 3224, ♀, 3223, (n). Pretoria, Febr. 1912 *Rogers* in T. 12041. Without precise locality Magaliesberg *Zeyher* (S.). Brooklyn, Mar. 1914, *Pott*. 4826 (T). Hammanskraal, hard deep compact clay, 17.10.34, *de Lange* 76, ♂ (N). Baviaanspoort, Febr. 1914, *Fehrson* in T. 13768, ♂ (T.), 3 sheets. Hammanskraal, red gravel, 17.10.34, *von Malitz*, 60 (N). Potgietersrust district; ? at Potgietersrust 3.11.08, *Leendertz* 6007, ♂ (A & T). ? Potgietersrust, 21.12.28, *Govt. Analyst* in N. 7817, ♀. "Mosdene" near Naboomspruit, loam formation climbing over bushes, 10.11.19, *Galpin* 477 M, ♂ (N). Ditto, 25.2.19, *Galpin* 142 M, ♀ (N & S). Ditto, in *Acacia* veld stems 1–2 M. arcuate, climbing up bushes, fls. creamy tuber very large, 3,800 ft. 21.11.34, *Galpin* 13196, ♀ (N). Rustenburg district; Brits, 29.12.27, *Watt and Brandwyk* 2045, ♀ (N). Ditto, 17.11.27, *Watt and Brandwyk* 2038, ♀ (N). Farm Welgevonden, 3,200 ft. 8.12.34, *Mogg* 14609, ♂ (N). Brits, 20.12.27, *De Rudder* in N. 7504, ♀ (2 sheets). Middelburg district; Niebo, Oct. 1921, *Rogers* 24853, ♂ (T). Potchefstroom district; on experimental farm, 5.1.31, *Theron* 5, ♀ (N). Bechuanaland; Mochudi, May 1914, *Rogers* (W). Saberonos, 10.12.36, *Watt and Brandwyk* 1683, ♀ (N). Mochudi, Jan. 1915, *Harbor* in T. 17027, ♀. Lydenburg district; Farm Schoonoord, Sukukuni, poisonous, black clay soil between norite boulders, 4,000 ft. 8.3.37, *Barnard* 229 A. Foothills, Camp

* *A. angustisecta* Engl. & Harms ex Engler, *Pflanzenwelt Afr.* III, 2 (1921), p. 605, in obs. was the original name for *A. stenodactyla* Harms which now stands as Burtl. *Davy* published his description first, necessitating Harms to change his epithet.

HB. Schoonoord 4,500 ft., 3.12.33, *Barnard* 229, ♀. Farm Korenvelden near Sukukuni, tuber topshaped, poisonous, 3,500 ft., 3.12.34, *Barnard* 153 (6 sheets). Ibid, small bulb, poisonous, used by natives, 3,000 ft., 8.11.34, *Barnard* 155. Ibid, 3,000 ft., 13.3.35, *Barnard* 305, ♀, all in N. Ohrigstad valley, 23.10.08, *Mundy*, in Bolus Herb. 4,700, ♀. Barberton District; without precise locality (? at Barberton), Nov. 1931, *Smith* 7019, ♀ (N). On road to Carolina (? from Barberton) \pm 4,000 ft., 5.10.30, *Bremekamp* in T. 28575, ♂. Glen-thorpe farm, 1.11.11, *Scheuble* in T. 10908, ♂. Without precise locality (? at Barberton) Jan. 1908, *De Beer* in T. 4940, ♂. Dry hillsides at Barberton, twining on shrubs, 2,000–2,800 ft., 1889 A.D., *Galpin* 677, ♂ & ♀ (N. 2 sheets), T & S.). ? at Barberton, 2,900 ft., 21.11.88, *Thorncroft* 15, ♂ (B). Ditto, Nov. 1909 *Williams* in T. 7645, ♀. Hyslops Creek, trailing, 2,500 ft., Apr. 1926, *Thorncroft* 2141, ♂ (N). Nelspruit district; Northern slopes of Amajuba mt., Schagen, climbing on trees, etc. stems several ft. long, 3,000 ft., Dec. 1934, *Liebenberg* 3362, ♀ (N). Ditto grown at Div. Pl. Ind. gardens, Pretoria, 19.1.37. Same locality, long stems, climbing, bulb 10–12 cm. diam. turbinate, 3,000 ft., 28.12.33 *Liebenberg* 3056, ♀ (N). At Schagen just off main road, 16 M. from Nelspruit, tuberous topshaped rootstock 15 cm. diam., climbing, stems several ft. long, 2,500 ft., Dec. 1934, *Liebenberg* 3301, ♂ & ♀ (N). Ditto, ♀ grown at D.P.I. gardens Pretoria, 19.1.37. From same locality but grown at D.P.I. gardens, *Liebenberg* 3055, ♀ (N). On farm Suidwalliskraal, on main road Nelspruit–Machadodorp, stems several ft. long, climbing, 2,800 ft., Dec. 1934, *Liebenberg* 3366, ♀ (N). On Research Station, Nelspruit, long stems climbing up trees, 2,375 ft., 1.11.30, *Liebenberg* 2544, ♀ (N). Plaston, climbing herb, 3,000 ft., Oct. 1931, *Holt* 75, ♂ (N). White River, Oct. 1919, *Rogers* 23288, ♀ (U & N). Doornkraal, 28.12.23 *Stubbs* ♀ (N). Mayfern, (grown at D.P.I. gardens, Pretoria), April 1929, *Mogg* 8182, ♀ (N), (2 sheets). Pietersburg district; Tzaneen, 8.12.36, *Hattingh* PS. 227, ♀ (N). Rooikoppies, Politsi, climber open parts of forest, Dec. 1932, *Schweickerdt* 1037, ♂ & ♀ (N. & T.), 4 sheets. Wood-bush, de Hoek, Dec. 1931, *Schweickerdt* in T. 30164, ♂, 2 sheets. Haenertsburg, Nov. 1913, *Pott* in T. 13368, ♂. Westfalia Estate, 17.11.36, *Pole Evans* 3983, (N.). Haenertsburg, Nov. 1917, *Moss and Rogers* 884, ♀ (U.), 2 sheets. Zoutpansberg district; Elim, Dec. 1930, *Obermeyer*, in T. 29287 and 29288, ♀. Louis Trichardt, Dec. 1922, *Breyer* in T. 24215, ♂. Tshakoma, Nov. 1931, *Obermeyer* in T. 30349, ♀. Pigeon Hole, 28.10.18, *McCallum* 70, ♀ (N). The Downs, Nov. 1918, *Rogers* 21937, ♀ (A, B. & T.). Middelburg district, Tautesberg, 9.11.33, *Young A.* 247, ♂ & ♀ (T), 3 sheets. Natal: Vryheid districts; Oct. 1905, *Sim* 2922, ♀ (B), 2 sheets. At Roman Catholic Miss. Stat. on Inkawana, on the Vryheid side of Besters Spruit, between diabase, strictly dioecious, 3 ft. high, ♂ flowers yellow, ♀ flowers green, poisonous, abundant. 4,000 ft., 20.10.37, *Gerstner* 2330 and 2331. ♂ & ♀ (N.). Nongoma district; at Nongoma, native name Umbulele (=poisonous plant), 20.1.38, *Gerstner* 2896 (N). Kruger National Park; Baiandbai, 24.11.32, *Lang* in T. 32154, ♂. Ditto, 25.11.32, *Lang* in T. 32153, ♀.

LITERATURE CITED.

1. ASCHERSON..... Baillons' Dictionaire, p. 47 (1876).
2. BAILLON, H..... Natural History of Plants (1888) VIII 476.
3. BENTHAM & HOOKER..... Gen. Plant. 1, III, 1867, p. 813.
4. BREMEKAMP, C. E. B..... Merkwürdige Sukkulენტentypen aus dem Nördlichen Transvaal. Vegetationsbilder 23 (1932) 3, p. 6. With plate.
5. DAVY, J. BURTT..... Transvaal Agric. Journ. VII (1908-9), P. 570.
6. ENGLER, A..... Passifloraceae Africanæ Bot. Jahrb. XIV (1892), 374-87.
7. HARMS, H..... Über die Verwertung des antom. Baues für die Umgrenzung und Einteilung der Passifloraceae. Bot. Jahrb. 15 (1893), 548-633.
8. ——— Passifloraceae. Natürliche Pflanzenfam. First Ed. (1895) III. Abt. VI und VIa. 69-94.
9. ——— Ditto. Nachtrag u. Register zu Teil II-IV, p. 255 (1895).
10. ——— Zur Morphologie der Ranken und Blütenstände bei den Passifloraceen. Bot. Jahrb. 24 (1898), 163-78.
11. ——— Passifloraceae. Engler's Pflanzenwelt Afrikas III (1921).
12. ——— Passifloraceae. Natürl. Pflanzenfam. 2nd Ed. Vol. 21 (1925), 470-507.
13. POTT, R..... A Contribution to the knowledge of the Transvaal Passifloraceae. Ann. Trans. Mus. (1917), 235-7.
14. ROEMER, M..... Synops. Monogr. II (1846).
15. SCHINZ, H..... Beitrag zur der Kenntniss Afrik. Passifl. Bot. Jahrb. 15 (1893). Beiblatt. 33 pp., 1-3.
16. ——— Beitrag zu der Flora Deutsch S.W.A. III.
17. SMITH..... Gramm. of Bot. 1888 (1821).
18. STEYN, D. G..... The toxicology of plants in South Africa. Central News Agency. S.A. 1934. p. 310-15.
19. WATT J. M. & BREYER-BRAND-WYK, M. G. The Medicinal and Poisonous plants of S.A., E. & S. Livingstone Edinburgh, 1932, p. 122.
20. WIGHT & ARNOLD..... Prodr. fl. Penins. Ind. Or. I, 353 (1834).



Plate 1.—*A. fruticosa* Burtt Davy. At Naauwpoort, near Pietersburg, Transvaal.

[Photo by H. Lung.

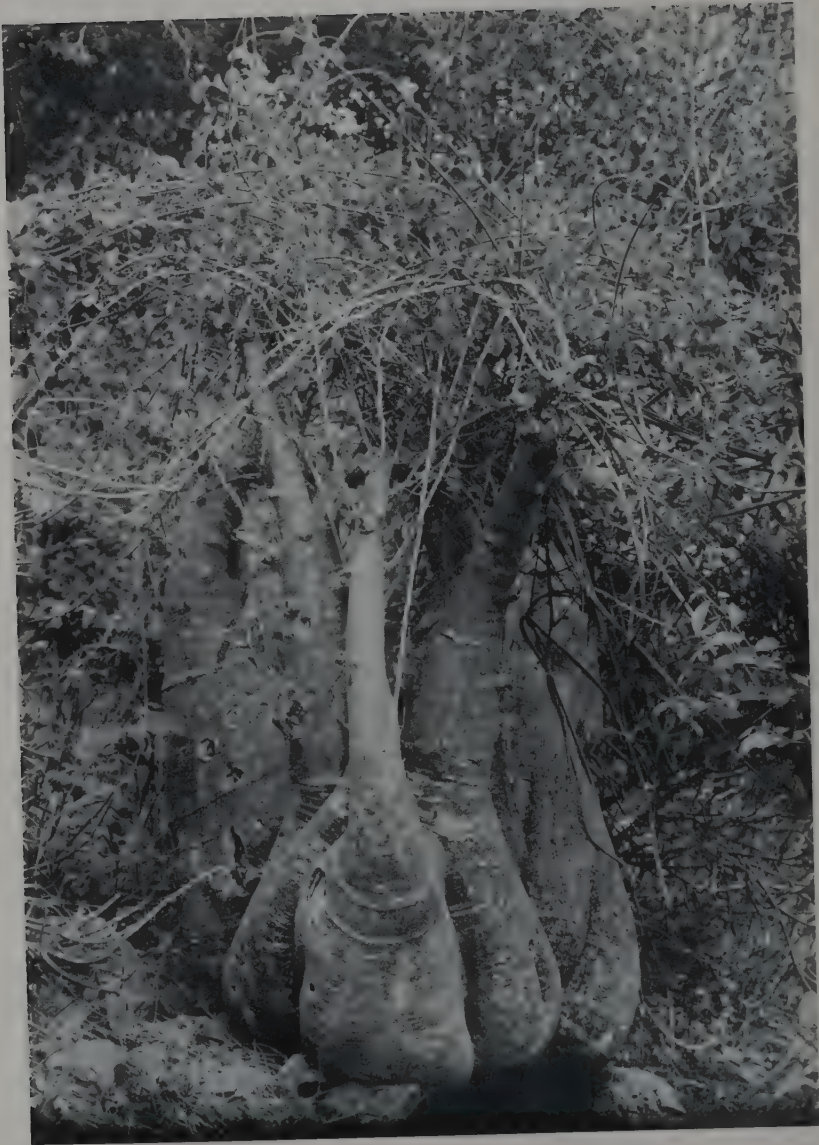


Plate 2.—*A. fruticosa* Burtt Davy. At Naauwpoort, near Pietersburg, Transvaal.
[Photo by H. Lang.]



Plate 3.—*A. spinosa* Burt Davy. At Naauwpoort, near Pietersburg, Transvaal.

[Photo by H. Lang.



Plate 4.—*A. glauca* Schinz. From Fairy Glen, near Pretoria. The light portion and below this was underground.

]Photo by H. King.



Plate 5.—Flowers of *A. glauca* Schinz.

[Photo by H. Lung.]



Plate 6.—Fruits of *A. digitata* (Harv.) Engl.

[Photo by H. Lung.]



Plate 7.—Two tubers of *A. digitata* (Harv.) Engl., found side by side at Baviaanspoort, outside Pretoria. The one was partly exposed and green; the other was underground.

[Photo by H. King.]



Plate 8.—A photo of the type specimen of *A. digitata* (Harv.) Engl.
 [Photo by courtesy of Kew Herb.]



Plate 9.—Photo of one of the type specimens of *Clemanthus senensis* Kl. ([*A. senensis* (Kl.) Engl.]. These specimens were collected at “Rios de Senna” and therefore was very likely the same locality where Kirk later collected his specimens (plates 12–14) which Masters described as *A. senensis*, Mast.

[Photo by courtesy of Berlin Herb.

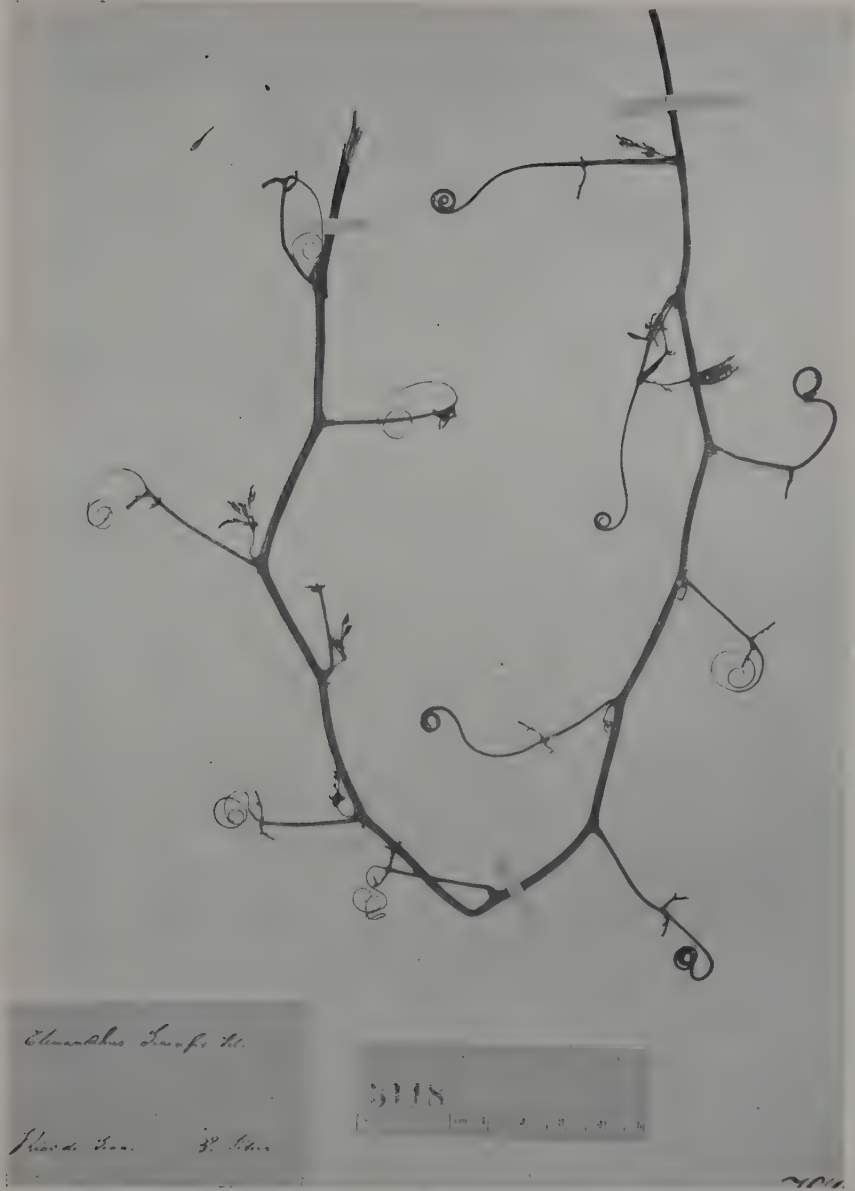


Plate 10.—Photo of one of the type specimens of *Clemanthus senensis* Kl.

[*A. senensis* (Kl.) Engl.].

[Photo by courtesy of Berlin Herb.



Plate 11.—Photo of the type specimen of *A. Buchanani* Harms.

[Photo by courtesy of Berlin Herb.]



Plate 12.—Photo of one of the specimens collected by Dr. Kirk at Senna, Zambezi, and from which Masters (Fl. Trop. Afr. Vol. 2) described *A. senensis* Mast. Practically all lobes are entire.

[Photo by courtesy of Kew Herb.]

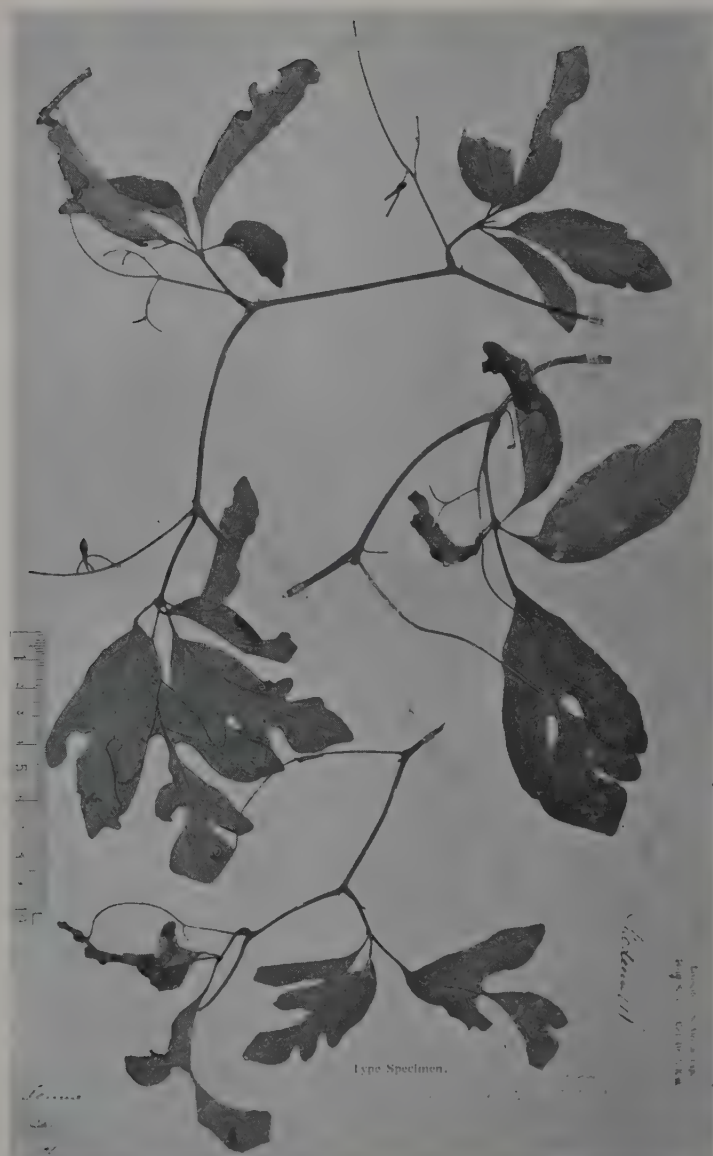


Plate 13.—Photo of one of the specimens collected by Dr. Krik at Senna, Zambezi, and from which Masters (F. Trop. Vol. 2) described *A. senensis* Mast. Practically all the median and side lobes are lobed.

[Photo by courtesy of Kew Herb.]



Plate 14.—Photos of one of the specimens collected by Dr. Kirk at Senna, Zambezi, and from which Masters (Fl. Trop. Afr. Vol. 2) described *A. senensis* Mast. The median lobes are only slightly lobed.

[Photo by courtesy of Kew Herb.]

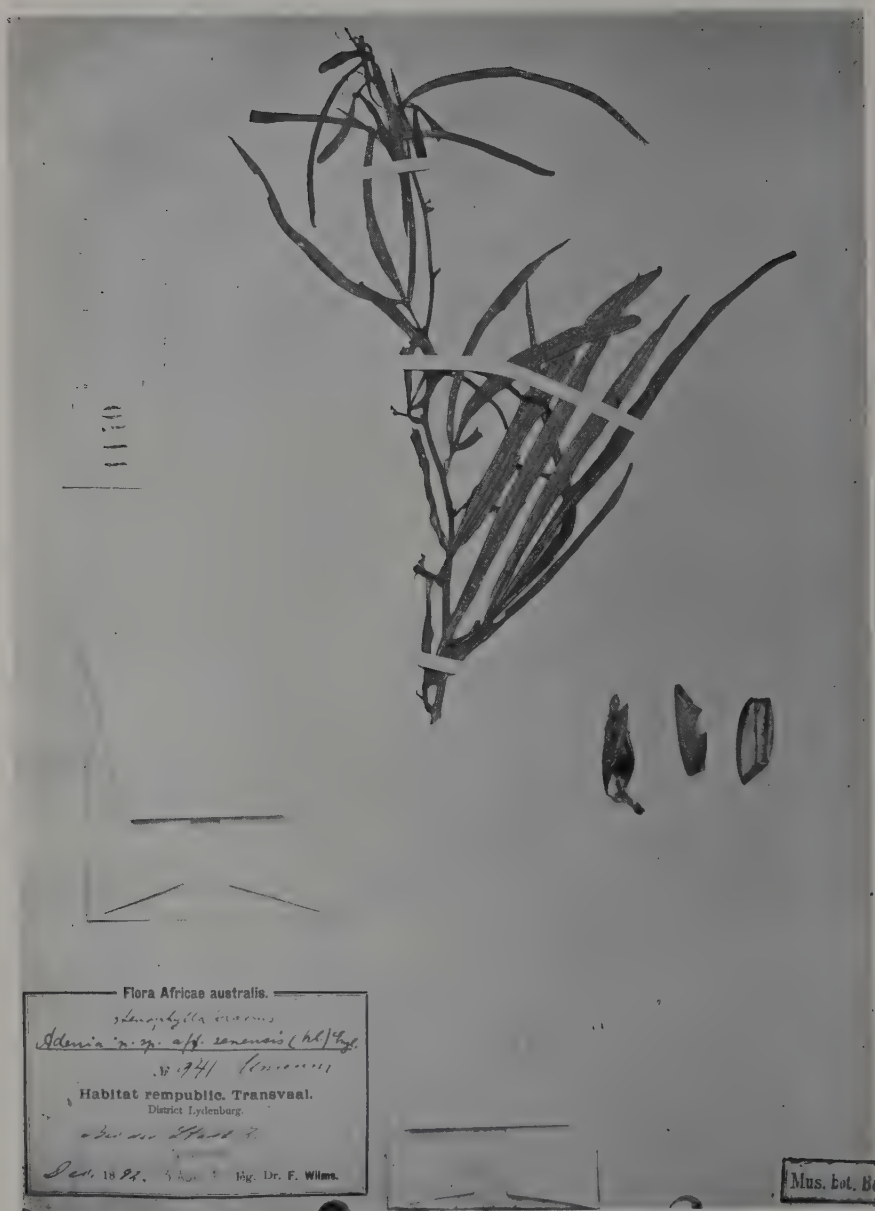


Plate 15.—Photo of the type specimen of *A. stenophylla* Harms.

Photo by courtesy of Berlin Herb.

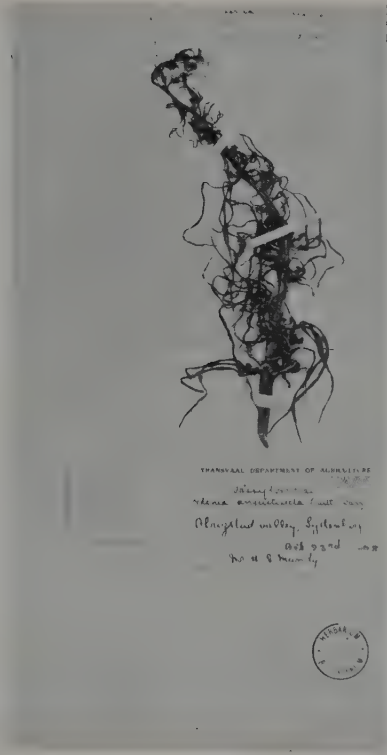


Plate 16.



Plate 17.

Plate 16.—A photo of Mundy in Bolus Herb. 4700, ♀, from Ohrigstad valley. It is the type specimen of *A. angustisecta* Burt Davy. In morphology of floral structures it resembles *A. digitata* and in leaf form it links up with other Lydenburg specimens (plate 17, etc.).

Plate 17.—A photo of Barnard 153 (1), showing 3-1 and 5-lobed leaves (entire).

[Photos by H. King.]

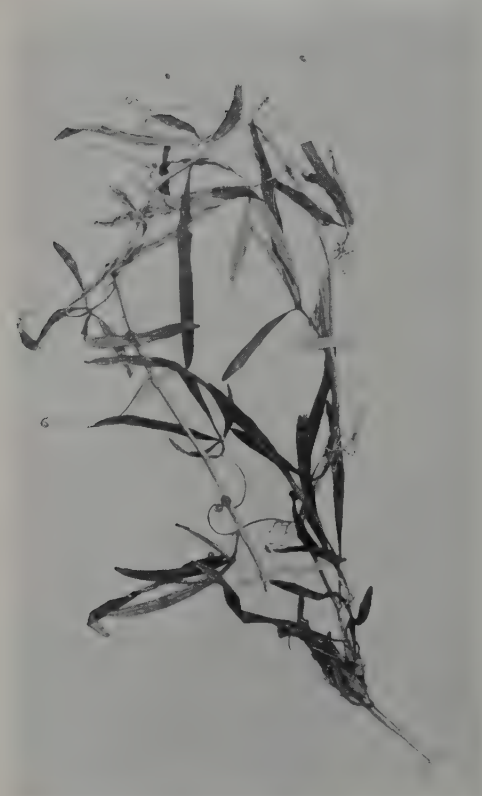


Plate 18.

Plate 18.—A photo of Barnard 155, showing all 5-lobed leaves (entire). *A. stenophylla* Harms (plate 15) fits in here.

Plate 19.—A photo. of Barnard 155 (collected leaves). All Barnard specimens are from Sukukuni, not very far from Lydenburg.



Plate 19.

[Photos by H. King.]



Plate 20.



Plate 21.

Plates 20 and 21.—These are photos of other Barnard specimens showing various degrees of lobing in the direction of the typical *A. digitata*.

[Photos by H. King.



Plate 22.

Plate 22.—This is a photo of another Barnard specimen showing various degrees of lobing in the direction of the typical *A. digitata*.

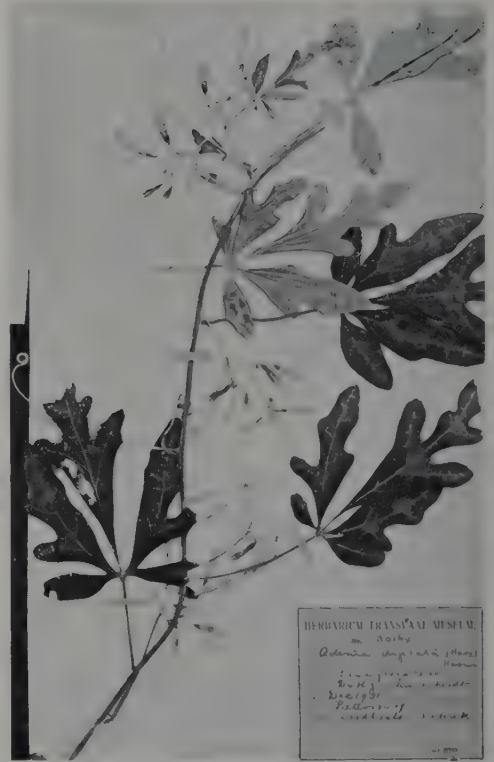


Plate 23.

Plate 23.—A photo of Schweickerdt in Trans. Mus. Herb. 30164, ♂. In leaf-shape it resembles the previous. The inflorescence is more elaborate. [Photo by H. King.]



Plate 24.



Plate 25.

Plate 24.—A photo of Liebenberg 3362. This links up with plate 23.

Plate 25.—A photo of Liebenberg 3366. This is from the same locality as that of plate 24, but from a different habitat, showing no lobing.
[Photo by H. King.]



Plate 26.—A photo of a specimen from the same tuber as Liebenberg 3366 (plate 25) but grown at the gardens of the Division of Plant Industry, at Pretoria. The specimen shows characteristic lobing. It is identical to Liebenberg 3362 when grown at the D.P.I. gardens, but the latter was not used as it would not have made such a good photo.

[Photos by H. King.]



Plate 27.



Plate 28.

Plates 27 and 28. —Photos of Galpin 677 (2 sheets), showing variation of the lobing. These link up with plate 26.

[Photos by H. King.]



Plate 29.—Photo of Williams in Trans. Mus.
Herb. 7645, ♀.



Plate 30.—Photo. of Smith 7019.

These link up with plate 28. Compare these with the photo of the type specimen (plate 8).

[Photos by H. King.]



Plate 31.—Photo of Scheuble in Trans. Mus.
Herb. 10908, ♂.

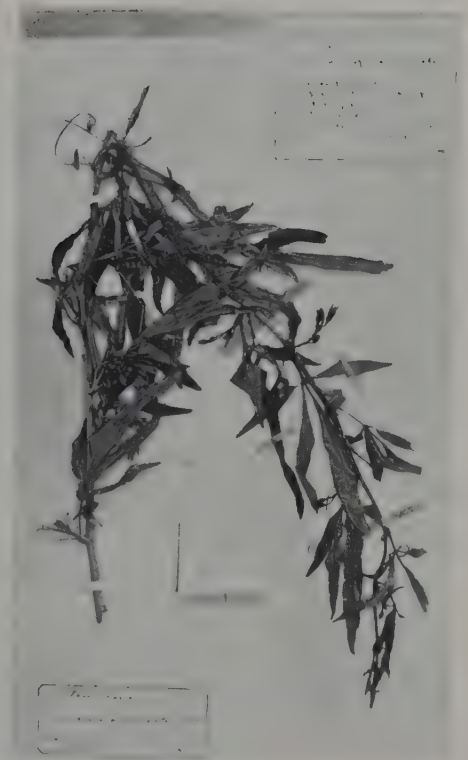


Plate 32.—Photo of Bremekamp in Trans. Mus.
Herb. 28575, ♂.

These link up with plate 18 on the one hand and with plate 25 on the other hand. The link between plates 32 and 35 is not very clear but is due to the fact that Liebenberg 3301 was omitted to reduce the number of plates.

[Photos by H. King.]



Plate 33.—A photo of Thornecroft 15, ♂. This links up with Liebenberg 3366 and 3362 (plates 24 to 26).

[Photo by H. King.]



Plate 34.

Photo of Obermeyer in Trans. Mus. Herb. 29287, ♀.

Photo of Obermeyer in Trans. Mus. Herb. 30349, ♀.

These link up with plate 33 and is where *A. senensis* Masters (plates 12, 13 and 14) fits in.
Compare the flowers on plate 34 with those on plates 33 and 23.



Plate 35.



Plate 36.—Photo of Barnard 229, ♀. This links up with plates 34 and 35 and this is clearly also where *A. Buchananii* Harms (plate 11) fits in.

A REVISION

of the

SOUTH AFRICAN SPECIES OF HYPERICUM

by
H. C. Bredell.

The first reference to a South African species of *Hypericum* appears in *Thunb. Prod. Fl. Cap.* 139 (1800) where a concise description of *H. aethiopicum* Thunb. is given. In *DC. Prod. I*, 550 (1823) another species *H. Lalandii* Choisy is enumerated and is also described in the *Fl. Trop. Afr.* 1: 155 (1868). In *Fl. Cap.* 117 (1859-1860) only three species were enumerated and a few years later Wood & Evans described *H. natalense* from Natal (*Journ. Bot.* XXXV: 487 (1897). In *Bull. Herb. Boiss* 179 Sér II, VIII, 1908, *H. Wilmsii* Rob. Keller appears in the author's key as a new species recorded from the Transvaal. Keller probably overlooked the description of *H. natalense* and described the same plant as *H. Woodii* in *Engl. Jahrb.* LVIII 193 (1923). The most recent revision of Tropical species appeared in *Journ. of Bot.* 329 (1927), where Good included the two South African shrubby species *H. leucoptychodes* Steud. and *H. Roeperianum* Schimper.

In the present revision only the South African species of the genus have been dealt with but as some species extend southwards from Tropical Africa, accounts of other species from this region have also been studied and compared with the South African plants. (Unfortunately most of the work has been carried out on dried specimens, fresh material of most species not being available at the time.) The large number of specimens investigated gave a good idea of the variability of most of the species and the search for constant specific characters in closely allied species proved to be a difficult task.

General Notes and Distribution.

South African species of *Hypericum* are recorded from South West Africa, the Cape Province extending inland and along the east coast as far north as Tropical Africa. Most of the species show an overlapping in distribution but others appear to be restricted to certain areas with the same climatic conditions. The variations and distribution of the different species are not only interesting from an ecological point of view but have proved useful in determining some of the species. In the accompanying maps the distribution of each species is shown.

Of all the species examined *H. Lalandii* Choisy (Fig. 1) shows the greatest range of variation in shape and structure of the vegetative parts. In almost every account of this species the authors refer to small plants ± 10 cm. high with very short leaves. According to Keller some forms are unbranched whereas others are branched from the middle. He also noticed the variations in size and shape of the leaves and showed that the typical form has the stems unbranched, medium-sized leaves (1 cm. long, 1-2 mm. broad) and flowers 1.5 cm. in diameter. Most of the specimens studied, fitted these earlier descriptions but a number of plants were different from the typical form. In plants branched from the middle, the leaves were usually larger, somewhat rigid in texture and more or less glaucescent. The specimen with the largest leaves *Payson* 33 collected at Tsolo (Tembuland) had some leaves which measured 3.7 cm. long and 1.7 cm. broad.

The varieties *lanceolata* and *latifolia* described by Sonder and the variety *lanceolatum* described by Keller are chiefly distinguished from the typical form by variations in leaf-size. Many of the specimens fitted these descriptions very well, but a number of successive transitional forms between the short, and long-leaved, narrow, and broad-leaved forms rendered it impossible to separate these extreme forms and to group them into the above varieties (Fig. 1, *a-h*). In the variety *macropetalu* described by Sonder, the petals are twice as long as the sepals a character which after careful measurement and comparison of the relative length of the sepals and petals in almost all the specimens, does not seem to be constant in any group of similar plants within the species. In the writer's opinion all plants, exhibiting these varying characters would be better considered as forms of the typical *H. Lalandii* with the variation in leaf-size probably due to the influence of a changed habitat; some growing in open and some in sheltered places. It is interesting to note that most of the broad-leaved specimens were collected near and along the east coast of Natal. A few specimens recorded from the eastern Transvaal which differed remarkably from the rest in having rigid glaucescent leaves, with the stems and leaves densely and prominently yellowish pellucid-dotted have been described as a new variety *transvaalense*. These characters are very constant and no intermediate forms were found.

The species is widely distributed from the southern Cape, along the east coast and inland as far north as Southern Rhodesia and is also recorded from South West Africa.

H. aethiopicum Thunb. (Figs. 2, 7 and 9) may be distinguished from *H. Lalandii* by its round stems, ovate leaves and black-dotted sepals and petals. The variety *glaucescens* described by Sonder on characters such as dwarf erect stems, glaucescent closely-set black-dotted leaves longer than the internodes, cannot be upheld because all these characters proved to be very variable in the great number of specimens examined. Moreover, the glaucescent leaves present in a few specimens do not justify a separation of these from the others because this character cannot be correlated with any other constant feature. This species extends south of north eastern Cape (Matatiele) as far as the Riversdale district.

H. Sonderi Bredell sp. nov. (Fig. 6) is closely allied to *H. aethiopicum* but differs from it in having spotted stems and no stalked gland-like protuberances along the margins of some bracts and sepals. All plants exhibiting the above characters have been previously named *H. aethiopicum*. In the description of *H. aethiopicum* Sonder refers to the toothed sepals as being an outstanding characteristic of the species. It is also interesting to note that there is almost no overlapping in the distribution of the two species. *H. Sonderi* extends southwards only as far as the north eastern Cape (Aliwal North) and *H. aethiopicum* is not known to occur north of Matatiele. A few specimens collected in the Pietersburg district, Transvaal, and which I have described as a new variety, *transvaalense* of *H. Sonderi* exhibit characters which link with *H. aethiopicum* and *H. natalense*. The flowers resemble those of *H. aethiopicum* in almost every detail but the leaves are much more like those of *H. natalense* being slightly membranous but larger.

H. Wilmsii R. Keller of which I have seen the type, shows an affinity with *H. aethiopicum* (Figs. 8 and 10) but the plants are usually small and more or less procumbent. Characters such as the oblong rounded sepals and the presence of black dots along the margins of the sepals and petals also links the species with *H. natalense*. This species occurs on mountains in the northern Cape, Basutoland and Transvaal. In the Flora Capensis Sonder referred Drège 7530 in Herb. Sond. collected at the Cape without precise locality, to *H. humifusum* Linn., a typical European species. He also states that the Cape specimens of this species are taller than usual but not otherwise different from the species. At Kew Dr. H. G. Schweickerdt very carefully compared Drège 7530 with the typical *H. humifusum*, and came to the conclusion that Drège's plant is not *H. humifusum* and that it is the same species as *Dieterlen* 1222 cited under *H. Wilmsii* in this revision. The European plant does therefore not occur in South Africa.

According to Medley Wood and Maurice Evans who described *H. natalense* (Figs. 3, 4, 8, 10) this species "has much the appearance of *H. aethiopicum* for which it has doubtless been mistaken; but it differs in having more numerous stems from the root . . . leaves which are subsessile and not amplexicaul, flat not revolute edges, sepals which are not lanceolate or acute; in the absence of black dots from the sepals, petals and anthers and by its 5 styles and 5-celled capsule." These observations were based on the type *Medley Wood* 4034 of which I have seen two duplicate specimens. After a careful examination of these it was found that some leaves showed revolute margins, at least in the dry state, that a few black dots are present along the margins near the apex of at least some petals and sepals, that the anthers are furnished with black dots and that the number of styles and chambers in the ovary may vary from 3 to 5. All the characters were confirmed in subsequent examinations of a number of specimens which undoubtedly are the same as *Medley Wood* 3034. These characters probably had been overlooked by the authors. Robert Keller overlooked the description of *H. natalense* and described a new species *H. Woodii* from *Medley Wood* 3034. In the description of *H. Woodii* Keller showed that the number of styles and chambers in the ovary may vary from 3 to 5 and remarks that the species "nimmt . . . innerhalb der Subsectio Homataenium durch die Veranderlichkeit in der Zahl der Fruchtblätter eine Sonderstellung ein". Although the species appears to be mostly confined to the province of Natal it occurs south as far as the Kentani district.

A specimen collected at Camperdown by Franks (Government Herb. Natal 12968) resembles specimens of *H. natalense* in most respects but the leaves are obovate with a short but distinct petiole. I have described this specimen as a new variety *petiolatum* (Fig. 4).

H. leucoptychodes Steud (Fig. 5) and *H. Roeperianum* (Fig. 11) Schimper differ from the other South African species of *Hypericum* in being shrubby with large flowers and relatively large leaves. Good in his account on the shrubby species of *Hypericum* of Tropical Africa pointed out that the best characters for primary classification are those of leaf-features, particularly the type of venation as seen on the under side of the leaf. *H. leucoptychodes* may therefore be distinguished from *H. Roeperianum* in having the tertiary venation slightly conspicuous giving the effect of small striae and pellucid veins; the tertiary venation in the leaves of *H. Roeperianum* is closely reticulated so as to form small but distinct meshes. According to Good the styles are almost united to the tip in *H. Roeperianum*. I have seen *Eyles* 795 and *Teague* 214 cited by him under *H. Roeperianum* and in neither of these could partly free styles be found. Subsequent investigations of a great number of specimens belonging to this species showed that the styles are always connate to the tip, with the stigma distinctly 5-lobed. Of the two species, *H. leucoptychodes* appears to have the wider range in South Africa, extending southwards from the tropics as far as north-eastern Cape. In South Africa *H. Roeperianum* is only recorded from the Lydenburg district of the Transvaal.

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I have to acknowledge with thanks the loan of specimens from the Transvaal Museum, Pretoria; the Herbarium of the South African Museum, Capetown; the Herbarium of the Albany Museum, Grahamstown; and the Natal Herbarium, Durban.

The following symbols accompanying the citations indicate the different herbaria where the specimens are kept.

- A. Albany Museum, Grahamstown.
- C. The Herbarium of the South African Museum, Capetown.
- P. National Herbarium, Pretoria.
- G. Galpin's Herbarium in P.
- M. Marloth's Herbarium in P.
- N. Natal Herbarium, Durban.
- T. Herbarium of the Transvaal Museum, Pretoria.

DESCRIPTION OF THE GENUS.

Shrubs or perennial herbs from a woody base. *Leaves* opposite, sessile, amplexicaul or shortly petiolated, entire, mostly pellucid-dotted, with or without reticulated veins. *Stipules* 0. *Inflorescence* a loose or compact cyme or flowers terminal on short lateral branches. *Flowers* yellow, bisexual, regular. *Sepals* 5, equal or subequal, acute or rounded at the apex, pellucid-dotted, with or without glandular stalked protuberances along the margins. *Petals* 5, twisted in bud, distinctly veined with black spots on the surface and margins or along the margins only. *Stamens* indefinite. *Filaments* thread-like, free or connate at the base into 3-5 distinct or indistinct groups. *Anthers* with or without black or yellow spots. *Ovary* superior, sessile, ovate to subround in outline, 3-5 chambered, with few to many ovules on parietal placentas; styles 3-5, free, or connate to the tip; stigmas small, capitate. *Fruit* a capsule with few to many seeds.

KEY TO THE SPECIES.

- A¹ Stems 4-sided or 4-ribbed; sepals and petals without black dots.
 a¹ Leaves and stems very prominently and distinctly yellowish pellucid-dotted; leaves linear-lanceolate, glaucescent. *H. Lalandii* var. *transvaalense*.
 a² Leaves and stems variously dotted but not as in var. *transvaalense*; leaves linear to ovate-lanceolate, glaucescent or not. 1. *H. Lalandii*.
- A² Stems round and smooth; sepals and petals usually black-dotted.
 b¹ Herbs or half-woody plants; flowers small, stamens connate at the base into 3 or 4 irregular groups.
 c¹ Sepals linear or linear-lanceolate, acute to sub-acute, equal; petals always black-dotted on surface and along the margins.
 d¹ Bracts and sepals without marginal stalked bodies; stems usually spotted, occasionally without spots.
 e¹ Leaves membranous, prominently dotted on abaxial surface; tertiary venation very distinct to form small meshes. *H. Sonderi* var. *transvaalense*.
 e² Leaves not membranous, variously dotted; tertiary venation absent or if present not conspicuous on both surfaces. 3. *H. Sonderi*.
 d² Bracts and sepals (at least some) with marginal black-tipped protuberances; stems spotless. 2. *H. aethiopicum*.
- c² Sepals oblong to obovate, rounded at the apex, unequal; petals usually with a few black marginal spots near the apex.
 f¹ Leaves sessile, elliptic to elliptic-oblong.
 g¹ Plants 30–40 cm. high, erect; leaves 1.5–2 cm. long. 5. *H. natalense*.
 g² Plants less than 20 cm. high, more or less procumbent; leaves usually less than 1 cm. long. 4. *H. Wilmsii*.
- f² Leaves shortly petiolated (especially on young branches), obovate. *H. natalense* var. *petiolatum*.
- b² Bush or shrub; flowers large; stamens connate at the base into 5 distinct groups opposite the petals.
 h¹ Styles connate to the tip with the free branches 1–2 mm. long; leaves 1.5–3 × 0.3–0.9 cm., narrowly lanceolate. 6. *H. leucoptychodes*.
 h² Styles connate to the tip with the stigma 5-lobed; leaves 4–7 × 1.5–2.5 cm., elliptic-lanceolate. 7. *H. Roeperianum*.
1. *H. Lalandii* Choisy. in DC. Prod. 1: 550 (1823); Fl. Cap. 1: 118 (1859–1860); Fl. Trop. Africa 1: 55 (1868); Bull. Herb. Boiss. Sér II, VIII: 187 (1908); Engl. Jahrb. LVIII: 197 (1923); Engl. & Prantl. Nat. Pflanzenfam. ed. 2, XXI: 181 (1925). *H. Lalandii* Choisy. var. *lanceolata*, var. *latifolia* and var. *macropetala* of Sond. in Fl. Cap. 1: 118 (1859–1860); *H. Lalandii* var. *lanceolatum* Rob. Keller in Bull. Herb. Boiss. Sér II, VIII: 187 (1908).

Semiherbaceous, 6–55 cm. high. *Stems* from a woody underground rootstock, erect or decumbent below, branched or unbranched, 4-ribbed, glabrous. *Leaves* sessile, ascending, 0.5–3.6 cm. long, 0.2–1.5 cm. broad, linear to ovate-lanceolate or oblong-elliptic, obtuse to sub-acute, entire, with numerous more or less translucent dots, 1- to 7-nerved, glabrous. *Flowers* few to many in terminal cymes. *Bracts* 1–9 mm. long. *Sepals* 2–10 mm. long, 1.5–3 mm. broad, linear-lanceolate, subacute. *Petals* 3.5–12 mm. long, 1.5–5 mm. broad, oblong to oblong-spathulate, distinctly veined. *Stamens* indefinite, 2.5–7 mm. long; filaments thread-like, free or connate at the base into a few irregular groups; anthers 0.25–1 mm. long. *Ovary* 1.5–8 mm. long, 1.5 mm. broad, 3- to 4-chambered; ovules many; styles 3–4, free, 1–4.5 mm. long; stigmas capitate.

SOUTH WEST AFRICA.—Waterberg Plateau: *Boss* in T. 34997! 34998! 34999!

CAPE PROVINCE.—Caledon district: Sir Lowry's Pass, farm Knoshoek, *Marloth* 4866! P. Mosselbay district: Vryersberg, May, *Muir* 2043! P. George district: In humid places, *Schlechter* 2373! A, C: *Paterson* 1236! A: *Marloth* 2545! P. Knysna district: Hackerville, March, *Breyer* in T 23914!. Humansdorp district: Zitzikamma, May, *Fourcade* 173! A: Flats Ratelsbosch, Nov., *Fourcade* 539! A: *Britton* 1167! A. Uitenhage district: In Van Stadesbergen and on swarded places on the hills of Adow and Krakamma, Sept.–Nov., *Zeyher* 361! A, C. Bathurst district: Trapps Valley, Dec., *Daly* 588! A. Albany district: Grahamstown, Hill slopes, Nov., *Galpin* 381! P: *Mac Owen* 192! A. N. and in Herb. MacOwanianum: *Daly* and *Sole* in T 12953!: Hill other side of Douglas Reservoir, April, *Daly* and *Sole* 141! A. Stockenstrom district: Katberg, *Galpin* 2072! P. East London district: Ovuton, very common in lands, growing in sandy soil, Dec., *Hilner* 379! A: June, *Rattray* 66! A. Komgha district: Komgha, among rocks, *Flanagan* 795! C. P. Kentani district: Sheltered damp places, *Pegler* 117! P in part. Port St. Johns district: Port St. Johns, *Wager* in P 21072!. Tsolo district: Tsolo, *Payne* 33! A. Flagstaff district: Fort William, Dec., *Tyson* 2828! A. Steynsburg district: Zuurburg, April, *Schonland* 3212! P, 3213! A. Maclear district: Maclear, *Murray* 25! A. Matatiele district: Cedarville, Mvenyani, near stream among rocks, Nov., *Bandert* 46! A. Griqualand without precise locality, *Tyson* 1230! C. *Prior* in P 21065! without locality.

ORANGE FREE STATE.—Fouriesburg district: Farm Dunelm, on mountain side in wet soil, *Potts* in Grey Univ. Coll. Herb. 3111! P. Bethlehem district: Bethlehem, railway enclosure in village, grassy and sandy places, common, Dec., *Phillips* 3215! P. Bothaville district: Bothaville, common in damp places, Jan., *Goossens* 1216! P. Heilbron district: Viljoensdrift, Jan., *Rogers* 4825! A, T.

BASUTOLAND.—Leribe district: Leribe, slopes, banks, damp spots, *Dieterlen* 678! P: south slopes of Leribe Plateau, *Phillips* 792! 905! 914! C.

NATAL.—Pinetown district: Durban, in humid places, *Medley Wood* 187! P and in N 852!. Polela district: Bulwer, Jan., *Bayer* 356! N. Pietermaritzburg district: Mount Ashly, *Mogg* 6375! P; Tweedie, *Mogg* 1192! P; Impolweni, Nov., *Rump* in N 20327!: Lidgetton, Jan., *Mogg* 6670! P, 6719! P; Allerton, Dec., *Mogg* 6536! P: *Dimock-Brown* 275! N. Umvoti district: Greytown, Nov., *Wylie* in N 21697! 21698! 20456! T 34130! 34131!. Eshowe district: Entumeni, Oct., *Wylie* in N 9253!. Entojaneni district: Ulundi, Jan., *Evans* 432! 19602! N; Melmoth, Dec., *Mogg* 6052! 4533! P. Estecourt district: Giant's Castle, Dec., *Symons* 290! T. Bergville district: National Park, Dec., *Galpin* 10177! P. Utrecht district: Farm Glen, Atholl, near Charlestown, Jan., *Smith* 5697! P.

SWAZILAND.—Mbabane district: Dalriach Mbabane, in swampy places, Dec., *Bolus* 11702! A.

TRANSVAAL.—Wakkerstroom district: Jan., *van Dam* in T 24643!. Ermelo district: Nov., *Collins* in T 12201!; on farm Nooitgedacht, not frequent, Dec., *Henrici* 1348! and 1551! P. Heidelberg district: Dec., *Leendertz* 1030! T. Potchefstroom district: Losberg, *Theron* 768! T. Krugersdorp district: Krugersdorp, *Jenkins* in T 9229!. Johannesburg district: Jeppetown Ridge, Nov.–Dec., *Gilfillan* 6087! A, P in part, 6088! A, P: Houghton Estate, in low grassy places, April, *Bryant* C 30! P; Turfontein, *Bryant* D 10! D 34! P; *Jenkins* in T 10310!. Benoni district: *Bradfield* T 225! P: *Gilmore* 2186! P. Rustenburg district: Groenkloof, *van Dam* in T 10283!. Vlakfontein, ten miles west of Koster, in vlei, Feb., *Liebenberg* 126! P. Pretoria district: On open grassy veld below the Wonderboom, Jan., *Smith* 2291! P, 2252! P; Oct., *Leendertz* 3730! T; Oct., *Pole Evans* 408! P. Middelburg district: Klein Olifants River, along river banks, Nov., *Young* A 91! T; *Hewitt* in T 10443!; Dec., *Gilfillan* 7163! A. Carolina district: *Rademacher* in T 7284!. Belfast district: *Leendertz* 2688! T; *Jenkins* in T 6800!.

Barberton district : Umlomati Valley, Feb., *Galpin* 1284! A, P; Berlin, Godwan River, Jan., *Hofmeyer* in P 21070!; Kaapsche Hoop, *Gilmore* 2229! P; Nelspruit, Nov., *Rogers* in T 2389! A, T. Pilgrims Rest district : Sabie, Tweefontein Experimental Area, Feb., *Wagner* A 84! P; Pilgrims Rest, Dec., *Smuts* and *Gillett* 2318! P. Lydenburg district : Graskop, in vlei ground, damp and marshy places, not common, *Irvin* 3! P; Nov., *Wilms* in T 5836!; Mac-a-Mac Falls, Jan., *Burt Dary* 5368! P. Waterberg district : Nydstroom, *van Dam* in T 19690! P; Naboomspruit, Mosdene, in grassy, sandy glades, *Galpin* R 257! P; Moorddrift, *Leendertz* 2148! T; Palala River, *Breyer* in T 21448! Pietersburg district : Damp places, Shiluvane, *Junod* 4289! T, P; Woodbush, *Mogg* 14705! P, 14675! P; *Rehman* 6340! P; *Wager* in T 23087!; *van Dam* in T 25641! Zoutpansberg district : Vlei plant, soil very moist, common, *McCallum* in P 21068!; farm Zoutpan, vlei behind homestead, *Obermeyer*, *Schweikerd* and *Verdoorn* 204! P, T.

SOUTHERN RHODESIA. —Matopos : *Eyles* 3767! C. Bulawayo : Nov., *Eyles* and *Johnson* 1098! A, 1100! A. Marandellas : Grass plots, Govt. Farm, Nov., *Rattray* 343! P.

H. Lalandii Choisy var. *transvaalense* Bredell var. nov. Caules foliaque valde prominenter et pellucido punctati.

TRANSVAAL.—Standerton district : Near Volksrust, *Gray* in P 22267! Ermelo district : Feb., *Leendertz* in T 7779!; Jan., *Collins* in T 6345!; Govt. School, *Nel* 35! P; Farm Nooitgedacht, in veld, common, Feb., *Henrici* 1538! P. Bethal district : Hoggeveld, Trichardsfontein, Feb., *Rehmann* 6608! P. Middelburg district : Witbank, Zondagsfontein, Dec.—March, *Thode* A 2789! P, N; near Witbank station, Dec., *Gillfillan* 7162! P in Part.

2. *H. aethiopicum* Thunb. in Thunb. Prod. Pl. Cap. 138 (1800); DC. Prod. 1 : 552 (1823); Engl. & Prantl. Nat. Pflanzenfam. ed. 2. XXI : 179 (1925). *H. aethiopicum* Thunb. var. *glaucescens* Sond. in Fl. Cap. 1 : 118 (1859–1860).

Semihieraceous, 10–40 cm. high. Stems few to many from a persistent rootstock, erect, branched, round and smooth, glabrous, without black dots. Leaves sessile, 0.5–2.4 cm. long, .03–1.7 cm. broad, oblong to elliptic-ovate, rounded at the apex, entire, prominently veined; tertiary venation absent, if present meshes conspicuous on upper surface only. Flowers in terminal lax or compact cymes. Bracts 3–7.7 mm. long, ovate to linear-lanceolate, acute or obtuse and with stalked, black-tipped protuberances along the margins. Sepals 4.5–7.5 mm. long, 3–5.5 mm. broad, oblong to linear-lanceolate, acute and with stalked black-tipped protuberances along the margins. Petals 0.6–1.5 cm. long, 3–5 0.5 mm. broad, oblong to oblong-spathulate, black-dotted along margins and on the surface. Stamens indefinite, 4.5–9 mm. long, filaments thread-like, free or usually connate at the base into 3 or more irregular groups; anthers 0.5 mm. long with or without black spots. Ovary 2–5.4 mm. long, ovate in outline, 3- or very occasionally 4-chambered; styles 3 or occasionally 4, free; 2.5–6 mm. long; stigmas capitate.

CAPE PROVINCE.—Riversdale district : Corente Riv., *Muir* 855! C, P; 4774! C. George district : Nov., *Prior* in P 21066! Knysna district : Gully, N.E. of Royal Hotel facing west, Dec., *Schonland* 3498! A; March, *Breyer* in T 23357! Plettenbergs Bay, without name of collector in C 29506! Humansdorp district : Assegaihos, Nov., *Marloth* 10931! P. Uitenhage district : Oct., *Zeyher* 149! C, 360! C in part. Albany district : Grahams-town, Howisons Poort, *McOwan* 397! A, N; grassy slopes Elandsdooft, *Galpin* 382! A, P. Bedford district : Dec., *Bennie* 213! A. Fort Beaufort district : Adelaide, Great Winterberg, Jan., *Ford* 11410! P. Stockenström district : Katberg, Nov., *Sole* 383! A. Victoria East district : Victoria East, *Rattray* 130! P. Kingwilliamstown district : Grassy places at foot of perie, *Flanagan* 2142! C, P. Cathcart district, In sandy spots along the Kabousie Riv., Dec., *Flanagan* 794! A, C; Fairford, Nov., *Cotterrell* 96! A. Herschel district : Sterkspruit, May, *Hepburn* 380! A. Griqualand without locality, Feb., *Tyson* 1376! P in part and Kaffraria without locality, *Cooper* 238! P.

3. **H. Sonderi** Bredell sp. nov., affinis *H. aethiopico* Thunb. sed foliorum margine haud dentato-glandulo, caulibus plerumque nigro-punctatis differt.

Herba perennis: caules 10-45 cm. alti, pauci vel plures, erecti, leviter ramosi, teretes levigati, nigropunctati vel haud-nigropunctati. *Folia* sessilia, 0.5-2.5 cm. longa, 0.3-1.5 cm. lata, oblonga vel late ovata, punctis nigrisve luteis, apice rotundata, nervis prominentibus; nervi tertii plus minusve conspicui vel absunt. *Flores* terminales in cymis laxis vel compactis dispositi. *Bractae* 3-8 mm. longae, 1.5-2 mm. latae, ovatae vel lineari-lanceolatae, acutae. *Sepala* 4.5-8 mm. longa, 1.5-3 mm. lata, lineari-lanceolatae, acuta, nigro-punctata. *Petala* 0.8-1.5 cm. longa, 2-6 mm. lata, oblonga vel oblongo-spathulata, nigro-punctata. *Stamina* indefinita, 5-9 mm. longa; filamenta filiformes libera vel basi polydelpha; antherae 0.5 mm. longae nigro-punctatae vel impunctatae. *Ovarium* 2.5-4.5 mm. longum, ovatum, 3-loculare; styli 3, liberi 3-6.5 mm. longi; stigmata capitata.

CAPE PROVINCE.—Aliwal North district: Doctors Drift, *Gerstner* 137! P in part. Matatiele district: Cedarville, on hillside, Nov., *Bandert* 102! A. Griqualand East without precise locality, *Tyson* 1376! C, N.

ORANGE FREE STATE.—Harrismith district: Platberg slopes, in grass, *Putterill* in C 16861!. Bethlehem district: Witzies Hoek, Feb., *Junod* in T 17321!.

BASUTOLAND.—Leribe district: *Dieterlen* 358! C, P; *Phillips* 921! C.

NATAL.—Pinetown district: Isipingo, *Medley-Wood* 12475! T, N; Amanzimtoti, June, *Forbes* 647!; Bothas Hill, Oct., *Medley-Wood* in N 6423!, 8004! C, C 11461! N, P. Camperdown district: *Schlechter* 3270! T, P, A. Pietermaritzburg district: Sept., *Rumpf* in N 20899! and 20316!. Impendhle district: Impendhle, Nov., *Levett* 83! N; Deepdale, in grass, Feb., *Maurice-Evans* 92! N. Estcourt district: Estcourt, *Mogg* 3516! P in part. Mooi Riv., Meteor ridge, Oct., *Mogg* 3235! P; Giant's Castle, *Symons* 132! T. Umvoti district: Greytown, Nov., *Wylie* in N 21699!. Entojaneni district: Melmoth, Sept., *Forbes* 733! N. Nongoma district: Nongoma, Nov., *Gerstner* in N 22257!. Bergville district: National Park, Drakensberg, Nov., *Oliver* 390! P; Mont-aux-Sources, near Tugela Drift, Nov., *Schweikerd* 823! T; Tugela Valley, grassland, common, Feb., *Bayer* and *McClellan* 212! P; Grantleigh, woody herb, *King* 9! P; grassy slopes, *Galpin* 11426! P. Kliprivier district: Ladysmith, Nov., *Rogers* in T 5146!. New Castle district: Charles-town, Boscobello, Jan., *Jenkins* in T 12486!. Utrecht district: Riversmoor, Viljoensdrift, Jan., *Parkhouse* in P 21064!; *Wahl* in T 15386!; grassy places, Spitzkop, Emangweni, Oct., *Thode* in Herb. Univ. Stellenbosch 9326! and in A.

SWAZILAND.—Hlatikulu district: Hlatikulu, *Stewart* 146! C, T.

TRANSVAAL.—Piet Retief district: Grassy slopes, Oct., *Galpin* 9638! P; *Jenkins* in T 10953!. Wakkerstroom district: Jan., *Beeton* 208! C; Dec., *van Dam* in T 24642!; Ermelo district: Spitskop, Dec., *Pott* 5100! T. Carolina district: Dec., *Rademacher* in T 7470!. Barberton district: Plastron, Oct., *Holt* 74! P; on summit, Saddleback Mts., southern slopes, Oct., *Galpin* 1116! A; *Galpin* 1028! G. Belfast district: Machadodorp, grassy fields, Nov., *Galpin* 12522! P; *Jenkins* in T 10301!; Rietvlei, Crocodile Riv., June, *Smuts* 29! P; Waterval Boven, Nov., *Rogers* 18396! P; Waterval Onder, Jan., *Jenkins* in T 6760!. Johannesburg district: Dec., *Leendertz* 1737! T; *Hutton* in A 1039!. Ventersdorp district: Goedgedacht, Dolomite Fountain in black loam, occasional *Sutton* 502! P. Rustenburg district: Vlaktefontein, 10 miles west of Koster in red loam, Feb., *Liebenberg* 170! P. Pretoria district: Ashbury Fountains, Nov., *Smith* 1381! P; Koedoespoort, *Smith* 1529! P; on banks of Aapies Riv., near zoo, *Smith* 207! P; Derdepoort, Feb., *Quin* in P 12953!; near stream, occasional, straight stem from underground rootstock, Dec., *Verdoorn* 16! P; Fountains Valley, in grass on east side of magnetite koppie, Nov., *Verdoorn* 580! P; Waterkloof in valley near stream, Jan., *Verdoorn* 77! C, P; Wolwekloof, western hillside, Feb., *Mogg* 15929! P; Aapies River, *Rehmann* 4350! P; Meintjeskop, Feb., *Burt-Davy* 3958! P; small shrub, with straight stems from an underground rootstock,

Oct., *Phillips* 3038! A, P; south-western slopes of Wonderboompoort, Nov., *Pole Evans* 63! P; Fountains Valley, *Repton* 65! P; *Leendertz* 221! T in part, in T 3734! and T 4173!; Nov., *Forbes* 810! N. Lydenburg district: Farm Swagershoek, very common, Jan., *Obermeyer* in T 27901!. Pilgrims Rest district: Mauchsberg, Sabie, Dec., *Smuts* and *Gillett* 2320! P; Olifants River, *van Niekerk* in T 7561!. Pietersburg district: Woodbush, Mountain Home Farm, Dec., *Mogg* 14711! P; Duiwelskloof, in slopes of valley in burnt veld, July, *Galpin* 9401! P. Zoutpansberg district: Growing on hillsides, Pigeon Hole, Oct., *McCallum* 17! P; ravines, dry places, Feb., *Junod* 4288! P, T. Transvaal without precise locality *Pocock* 36! A.

H. Sonderi Bredell var. *transvalense* Bredell var. nov. Folia membranacea infra prominente lepidota supra et infra reticulata nervis tertiis conspicuis.

TRANSVAAL.—Pietersburg district: Woodbush, Mountain Home Farm, erect "herb", common in moist places in grassland, Dec., *Mogg* 13996! P; Shiluvane, *Junod* 4290! T, P. *Wager* in T 7223! without locality, in part.

4. *H. Wilmsii* Rob. Keller in Bull. Herb. Boiss. Ser. II. VIII: 179 (1908).

Semiherbaceous, less than 20 cm. high. Stems many from a persistent tap root, more or less procumbent, branched, round and smooth, glabrous. Leaves sessile, 0.5–1.5 cm. long, 0.2–0.6 cm. broad, elliptic-oblong, rounded at the apex, entire, 1- to 3-nerved; tertiary venation inconspicuous or absent. Flowers in few-flowered cymes at the end of the branches. Bracts leaf-like, obtuse. Sepals 4.5–6 mm. long, 1.5–2.5 mm. broad, oblong, rounded at the apex, distinctly veined with black dots along the margins and yellowish spots on the surface. Petals 5–8 mm. long, 2–2.5 mm. broad, oblong to oblong-spathulate, sparsely black-dotted along the margins near the apex. Stamens indefinite, usually less than 30; filaments threadlike, free or connate at the base into a few irregular groups, 4–5 mm. long; anthers 0.25–0.5 mm. long, each with a black dot. Ovary 2.5–4 mm. long, ovate in outline, 4-chambered; styles 4 or very occasionally 3, free, 1.5–2 mm. long; stigmas capitate.

CAPE PROVINCE.—Murraysburg district: *Tyson* 413! A. Queenstown district: Mountain sides, Nov., *Galpin* 1629! P. Aliwal North district: Elandshoek, moist ground near water course, Oct., *Bolus* 153! C, P; Doctors Drift, *Gerstner* 137! P, in part. Herschel district: Majubane, near Sterkspruit, Dec., *Hepburn* 92! A.

BASUTOLAND.—Mafeteng district: Slope of Ha-Muya-pela Mt., Likhoel, Jan., *Dieterlen* 1222! P; bank of Catai Riv., Ha-Ma-Khonofane, Nov., *Dieterlen* 1293! P.

TRANSVAAL.—Lydenburg district: Near town, Jan., *Wilms* 136! (fragment of the type in P).

5. *H. natalense* Wood & Evans in Journ. Bot. XXXV: 487 (1897); Engl. & Prantl., Nat. Pflanzenfam. ed. 2, XXI: 177 (1925); Burt Davy, Flow., Pl. and Ferns of the Transv. and Swaziland 1, 251 (1926) *H. Woodii* Rob. Keller in Eng. Jahrb. LVIII: 193 (1923).

Semiherbaceous, 15–40 cm. high. Stems 1 to many from a persistent underground rootstock, erect, much branched, round and smooth, glabrous. Leaves sessile, 0.5–2 cm. long, 0.3–1.5 cm. broad, elliptic to oblong-elliptic, rounded at the apex, entire, 3- to 7-nerved; tertiary venation distinct, with the meshes small and punctate. Flowers terminal. Bracts leaf-like, obtuse. Sepals 4.5–7 mm. long, 1.5–4 mm. broad, oblong to oblong-spathulate or obovate, rounded at the apex, distinctly veined, densely dotted with yellowish spots. Petals 5–9 mm. long, 2.5–3.5 mm. broad, oblong to oblong-spathulate, distinctly veined with occasional black spots along the margins near the apex. Stamens indefinite, 3.5–7 mm. long; filaments threadlike, free or connate at the base into 3 or 4 irregular groups; anthers 0.25–1 mm. long, each with a black dot. Ovary 2.5–4 mm. long, ovate in outline, 3-, 4- or 5-chambered; styles 3, 4 or 5, free, 2–3 mm. long; stigmas capitate.

CAPE PROVINCE.—Kentani district: Damp valleys, Oct., *Pegler* 117! A, P in part. Tsolo district: *Payne* 14! A.

NATAL.—Pietermaritzburg district: Balgowan, Oct., *Mogg* 5610! P; April 3809! P; Allerton, Dec., *Mogg* 6567! P. Lions River district: Howick Falls, Nov., *Rogers* in T 5212!; St. Ives, Dargle Road, Oct., *Mogg* 5679! P. Estcourt district: Near bank of Mooi River, Oct., *Medley-Wood* 4034! N, A. Umvoti district: Greytown, Oct., *Wylie* in N 21576!, in N 21577!, in N 22378! and in T 34129!.

H. natalense W. & E. var. *petiolatum* Bredell var. nov. Folia petiolata obovata; petioli 0.5–1 mm. longi.

NATAL.—Camperdown district: *Franks* in N 12968!.

6. *H. leucoptychodes* Steudel ex Richard in Tent. Fl. Abyss. 1: 96 (1847); Engl. & Prantl. Nat. Pflanzenfam. ed. 2, XXI: 176 (1925); Journ. Bot. LXV: 330 (1927). *H. lanceolatum* Lam. ex Oliver in Fl. Trop. Afr. 1: 156 (1868); Burt Davy in Fl. Pl. and Ferns of Transv. and Swaziland 1: 251 (1926) and of Hutchinson and Dalziel in Fl. West. Trop. Africa 1: 230 (1927).

Woody shrub, 4–8 ft. high. Stems much-branched, round or almost so, glabrous; internodes very short. Leaves sessile, 1.5–3 cm. long, 0.3–0.9 cm. broad, narrowly lanceolate, sub-acute, narrowed towards the base; venation regularly but sparsely pinnate; the tertiary venation somewhat conspicuous and often having the effect of small striae. Flowers large and terminal. Bracts 0.4–1.5 cm. long, 3–7 mm. broad, ovate to ovate-lanceolate, acute or obtuse. Sepals 6–9 mm. long, 3.5–6 mm. broad, ovate to broadly-ovate, obtuse, with minute stalked protuberances on the margins. Petals 1.6–3.7 cm. long, 0.5–1.5 cm. broad, oblong-spathulate, distinctly veined and occasionally with stalked bodies along the margins. Stamens indefinite, 0.8–1.5 cm. long, filaments thread-like, connate at the base into 5 very distinct groups opposite the petals; anthers 0.5–1 mm. long, occasionally with yellow gland-like bodies between the thecae. Ovary 4–8 mm. long, ovate to broadly ovate in outline, 5-chambered; styles 5, 5–9 mm. long, connate almost to the tip, with the free branches 1.5–2 mm. long; stigmas capitate.

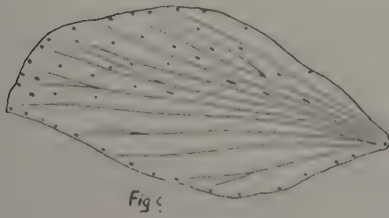
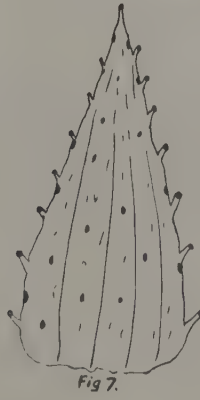
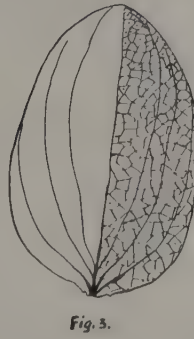
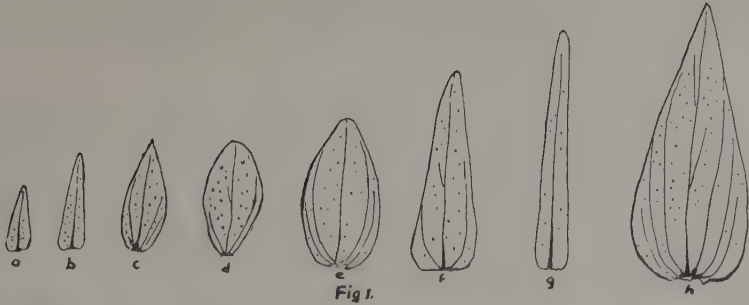
CAPE PROVINCE.—Umzimkulu district: Edge of Malowe forest, near Clydesdale, March, *Tyson* 3044! T, C, P.

NATAL.—Richmond district: Richmond, May, *Medley-Wood* 1995! N. Nkandhla district: Qudeni Forest, *Sim* 2942! N; Govt. Forester in Forest. Dept. Herb. 8637!; *Kotze* 113! P; *Gerstner* in N 23007!.

SWAZILAND.—Mbabane district: Jan., *Rogers* 11483! A, P.

TRANSVAAL.—Barberton district: *Thornicroft* 342! P and in T 3929!; banks of streams upper Moodies and also Devil's Kantoer, *Galpin* 658! C, A, P; Kaapsche Hoop, shrub, whole plant strongly scented, Oct., *Thode* 1565! N; Dec., *Gilmore* 2248! P. Lydenburg district: *Schlechter* 3942! A, C, N, P, T; farm Swagershoek, Jan., *Obermeyer* 238! T; on bank of stream and edge of forest, common, Aug., *Keet* 1108! P; Sabie Falls in kloof and along streams, June, *Burt Davy* 442! P, N. Pietersburg district: Haenertsburg, *van der Merwe* in P 21060!; *Murray* 730! P; *Corlett* 142! P; Broederstroom farm, Nov., *Hodgson* in P 11416!; Magoebaskloof, March, *Potts* 3652! P; *Pole Evans* in P 21061!; New Agatha, June, *McCallum* in P 21060!; Woodbush, Kratzenstein, July, *Hoffman* 98! T; *Jenkins* in T 7181!; *van Dam* in T 25632!. Zoutpansberg district: Ntabini Forest, near Louis Trichardt, June, *Galpin* 10314! P; Nov., *Obermeyer* 1124! T; Laastgevonden, growing along rivers where the soil is damp, Sept., *Koker* 18! P; Cyprus Poin, edge of woods, *Junod* 4207! P.

SOUTHERN RHODESIA.—Inyananga: Common, *Henkel* 2568! P. Umtali: July, *Pardy* 5105! P. Stapleford, Oct., *Rattray* 126! P.



7. **H. Roeperianum** Schimper in Tent. Fl. Abyss. 1: 96 (1847); Engl. & Prantl., Nat. Pflanzenfam. ed. 2, XXI: 176 (1925); Journ. Bot. LXV: 331 (1927). *H. Quarstinianum* Rich. ex Oliver in Fl. Trop. Africa 1: 156 (1868).

Woody shrub, 5–12 ft. high. *Stems* erect, slightly branched, almost smooth, glabrous. *Leaves* sessile, 4–7 cm. long, 1·5–2·5 cm. broad, elliptic-lanceolate, obtuse to sub-acute, cuneate at the base, dark on the upper surface, much paler beneath; venation almost reticulated, with the meshes small and punctate. *Flowers* large, terminal. *Bracts* 4·5–7 mm. long, 2·5–3 mm. broad, lanceolate to ovate, obtuse or sometimes acuminate, black-dotted or with gland-like bodies along the margins. *Sepals* 5–6·5 mm. long, 2·5–4 mm. broad, ovate to broadly-ovate, obtuse, with black dots and stripes near the margins and minute stalked bodies along the margins. *Petals* 2–3 cm. long, 1–1·5 cm. broad, oblong-spathulate, partly fleshy, with occasional black dots and stalked gland-like bodies along the margins. *Stamens* indefinite, 1·4–1·7 mm. long; filaments thread-like, connate at the base into 5 distinct groups opposite the petals; anthers 1 mm. long, occasionally with white gland-like bodies between the thecae. *Ovary* 5–6·5 mm. long, ovate to sub-round, 5-chambered; style 1, 0·6–1 cm. long; stigma distinctly 5-lobed.

TRANSVAAL.—Lydenburg district: Mariepskop, Nov., *Fitzsimons* and *van Dam* in T 26311!; April, *van Son* in T 32921!.

SOUTHERN RHODESIA.—Umtali: July, *Pardy* in Govt. Herb., Salisbury 5092! and in P. Odzani Riv. valley, *Teague* 214! C. Vumba Mts., margins of forest, "Cloudlands", July, *Galpin* 9247! P. Melsetter, June, *Rump* in N 23094!; common shrub, large, showy, June, *Eyles* 795! C.

EXPLANATION OF FIGURES.

Fig. 1, *a-h*, different shapes and sizes of leaves of *H. Lalandii*; Fig. 2, abaxial surface of leaf of *H. aethiopicum*; Fig. 3, abaxial surface of leaf of *H. natalense*; Fig. 4, leaf of *H. natalense* var. *petiolatum*; Fig. 5, abaxial surface of leaf of *H. leucoptychodes*; Fig. 6, sepal of *H. Sonderi*; Fig. 7, sepal of *H. aethiopicum* showing the stalked gland-like protuberances along the margins; Fig. 8, sepal of *H. natalense* and *H. Wilmsii*; Fig. 9, petal of *H. aethiopicum*; Fig. 10, petal of *H. natalense* and *H. Wilmsii*; Fig. 11, abaxial surface of leaf of *H. Roeperianum*.

UNION OF SOUTH AFRICA

H. Lalandii.



Scale 1 : 2,000,000 or 67 1/2 Miles to 1 Inch

0 10 20 30 40 50 60 70 80 90 100 Miles

0 10 20 30 40 50 60 70 80 90 100 Kilometers

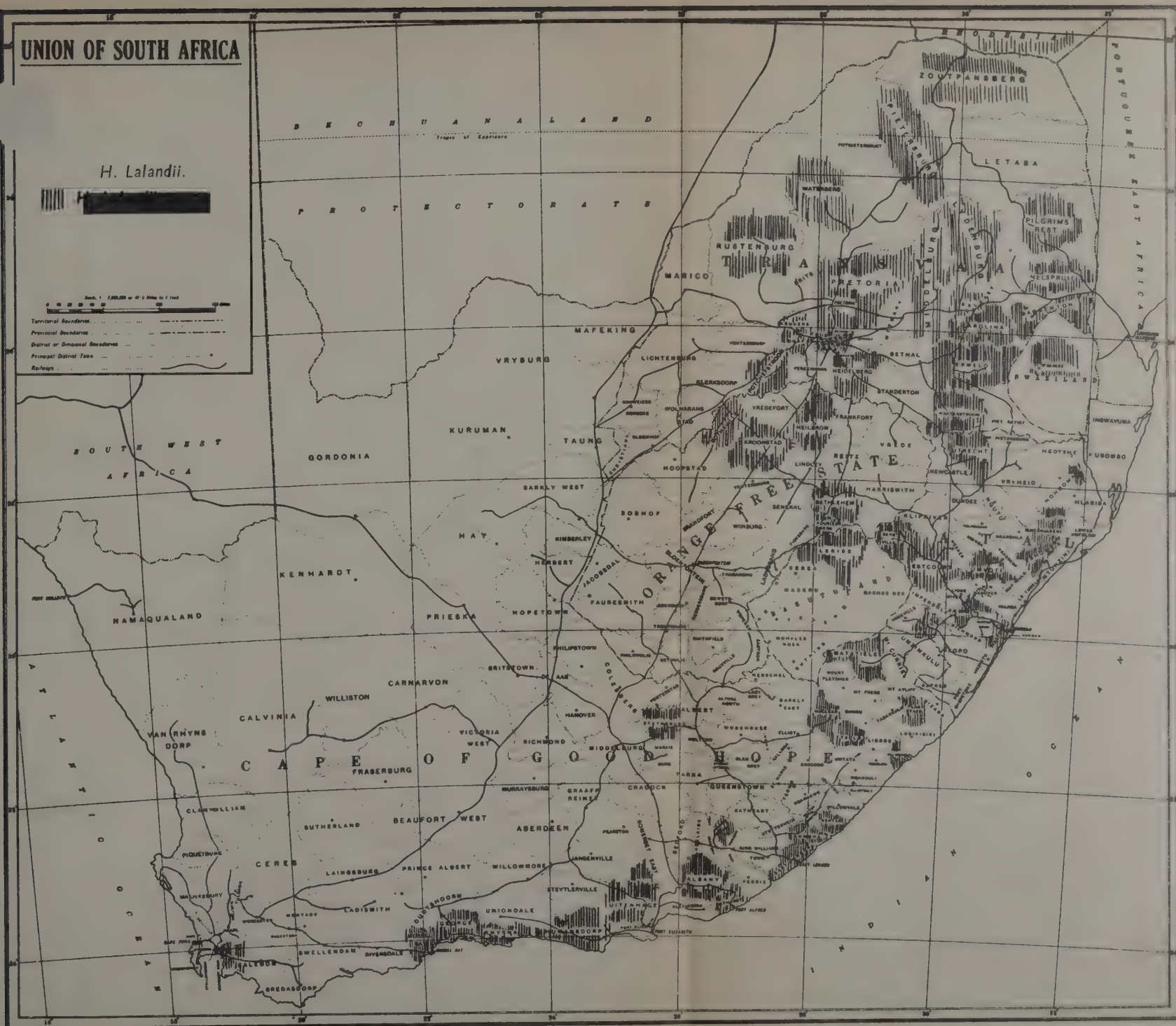
Territorial Boundaries

Provincial Boundaries

District or Divisional Boundaries

Principal District Towns

Railways



UNION OF SOUTH AFRICA

H. Lalandii var.

Transvaalense

H. Roeperianum

Scale 1 : 2,000,000 or 12 1/2 Miles to 1 Inch

Territorial Boundaries
Principal Boundaries
District or Divisional Boundaries
Principal District Towns
Railways



UNION OF SOUTH AFRICA

H. Sonderi



H. aethiopicum

Scale 1 : 1,000,000 or 17.5 Miles to 1 Inch

Territorial Boundaries
 Provincial Boundaries
 District or Subdivided Boundaries
 Principal District Towns
 Railways



UNION OF SOUTH AFRICA

||||| H. Wilmsü

⊙ H. Natalense

≡ H. Sonderi var.
Transvaalense

Scale: 1:2,000,000 or 17 1/2 Miles to 1 Inch

Territorial Boundaries
Provincial Boundaries
District or Divisional Boundaries
Principal District Towns
Railways



UNION OF SOUTH AFRICA

H. leucoptychodes

Scale 1 : 2,000,000 or 1:1,000,000

Legend:

- Territorial Boundaries
- Provincial Boundaries
- District or Divisional Boundaries
- Principal District Towns
- Railways

The map shows the following regions and towns:

- Orange Free State:** Bloemfontein, Ficksburg, Pekaia, Teyateyanan, etc.
- Cape of Good Hope:** Cape Town, Stellenbosch, Swellendam, etc.
- Transvaal:** Pretoria, Johannesburg, Pietermaritzburg, etc.
- Other regions:** Bechuanaland, Namaqualand, etc.

UNION OF SOUTH AFRICA

H. leucoptychodes

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UNION OF SOUTH AFRICA

H. leucoptychodes

Scale 1 : 2,000,000 or 10:1 mile to 1 inch

Legend:

- Territorial Boundaries
- Provincial Boundaries
- District or Divisional Boundaries
- Principal District Towns
- Railways

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UNION OF SOUTH AFRICA

H. leucoptychodes

Scale 1 : 2,000,000 or 1:1,000,000

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UNION OF SOUTH AFRICA

H. leucoptychodes

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UNION OF SOUTH AFRICA

H. leucoptychodes

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UNION OF SOUTH AFRICA

H. leucoptychodes

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- Other regions:** Bechuanaland, Boshof, etc.

THREE SPECIES OF STRYCHNOS WITH 1- SEEDED FRUITS.

by
I. C. Verdoorn.

When naming specimens of *Strychnos* with 1-seeded fruits (rarely 2-seeded) sent in by Mr. W. E. Marriott of Durban, a few interesting points came to light. As a consequence it is now possible to define the three species concerned more completely. The specimens were from trees marked Nos. I, II and IV. At first only fruiting material was sent and flowers of Nos. I and II were received later when they developed in November. Unfortunately the flowers of No. IV were not obtained.

In specimen No. I (Fig. 1) the leaves are up to 6 cm. long and 2·5-3 cm. wide, more or less elliptic; buds short, ovate; perianth-tube short, sparsely hairy in the throat; lobes quite glabrous; fruit dark green, oblong, equal-sided at the base; seed shaped like a coffee-bean being deeply channelled down one side and rounded on the other.

Specimen No. II (Fig. 2) has leaves up to 4·2 cm. long and 2·5 cm. broad, more or less obovate; buds oblong; perianth-tube as long as the lobes; lobes distinctly bearded; fruit light green to yellow and reddish, oblong or globose oblique at the base; seed oblong globose, slightly compressed, not channelled down one side.

Specimen No. IV (Fig. 3) has leaves 4-6 cm. long and 2·3-5 cm. broad, ovate, long acuminate, folding along the midrib; upper surface shiny; fruit globose, distinctly stipitate; seed globose, slightly compressed (flowers not seen).

This plant with the stipitate fruit and the long-acuminate, folded leaves did not agree with the description of any known South African species.

With regard to No. I, as far as the leaves and flowers were concerned it appeared to be *S. Henningsii* as described in Fl. Cap. Vol. 4 pt. 1, 1051 (1909). The seed, however, is here described as "globose or ovoid" whereas the coffee-bean-like seed of No. I is very distinctive. To elucidate this point the specimens in all South African herbaria were examined. This showed that leaves, flowers and fruits characteristic of No. I are always correlated with the coffee-bean shaped seed. Such specimens were usually identified as *S. Henningsii*. This species was originally described on leaf characters only and the type specimen is housed in the Berlin Herbarium, Dahlem. Searching other botanical literature for mention of the species it was found in Wood's *Natal Plants* and Sim's *Forests and Forest Flora of the Cape Colony*. In the former the description and drawing of leaves, flowers

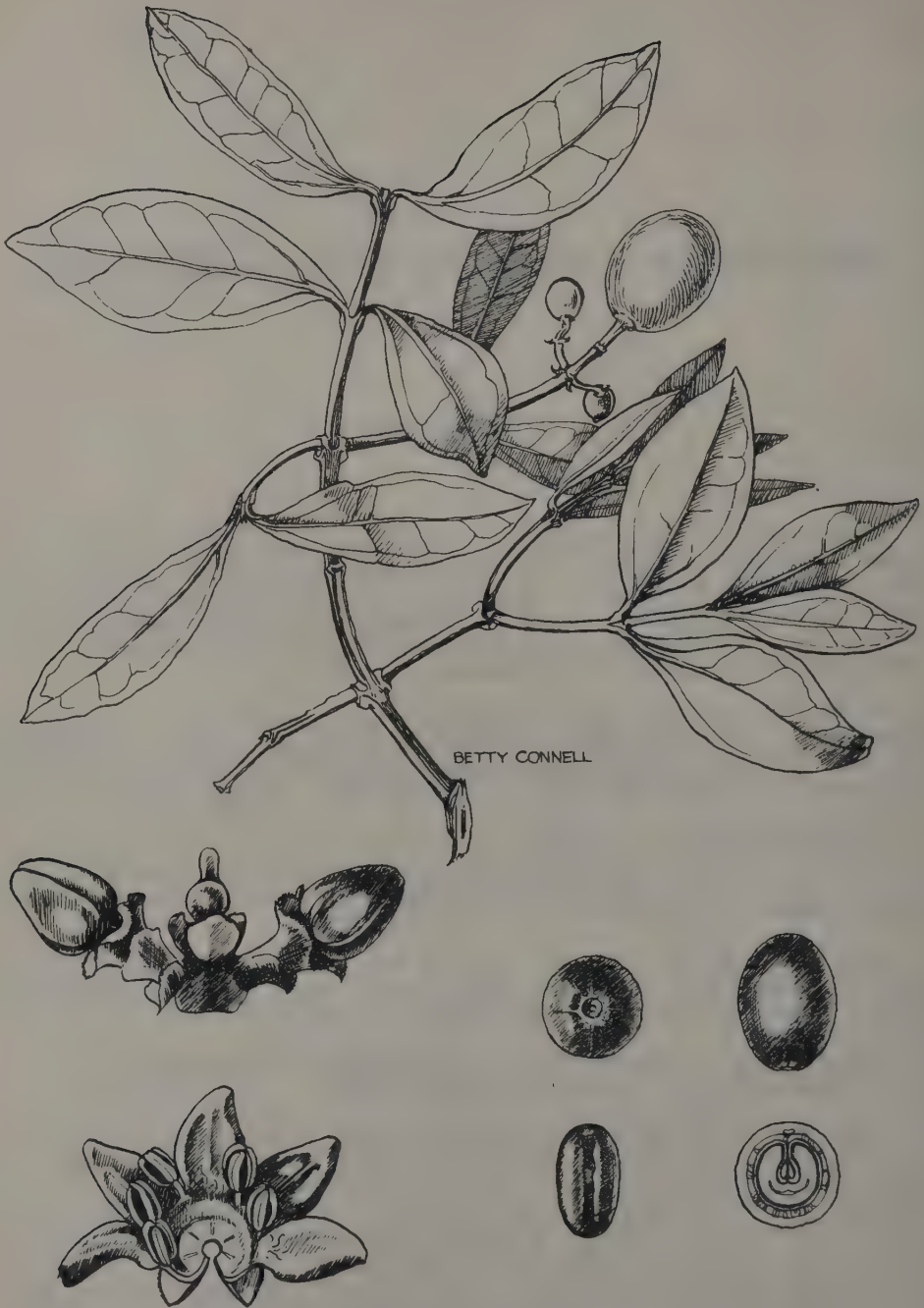


Fig. 1.—*Strychnos Henningsii* Gilg (Marriott 1).



Fig. 2.—*Strychnos decussata* (Pappe) Gilg (= *S. Atherstonei* Harv.) (Marriott II).



BETTY CONNELL.

Fig. 3.—*Strychnos micans* Sp. Moore (Marriott IV).

and fruits are those associated with the coffee-bean seed. The seed itself is not figured but is described as "globose" and a note added that only 1 fruit had been seen. In the latter publication for the first time the characteristic seed was clearly figured and described. The figure agrees also in the other characters associated above with such seeds. From this it was concluded that the description of the seed of *S. Henningsii* in the *Flora Capensis* was inaccurate and that the error was repeated by J. Medley-Wood.

The material of No. I was later taken to the Royal Botanic Gardens, Kew and there, through the courtesy of the Director and the Director of the Botanisches Museum, Berlin-Dahlem, the type material of *S. Henningsii* Gilg (2 leafy specimens collected at Durban) was borrowed. Dr. H. G. Schweickerdt, Botanist for South Africa at Kew, examined these types and reported that the leaves had the general characteristics of those usually placed in *S. Henningsii* (and which had been proved to be correlated with the coffee-bean shaped seed) but were on the whole larger. He matched one or two leaves on the Marriott specimens with those of *Beyrich I* (i.e. one of Gilg's syntypes) and on *Wood 6672*, which is a duplicate of the specimen Medley-Wood described and figured in *Natal Plants*, Dr. Schweickerdt wrote "Leaves marked *a*, *b* and *c* are an excellent match of those on *Beyrich I*". He noted too that on *Bachmann 1745* (the other syntype) the collector gives a native name "Umnonono" for the tree and it is the same as mentioned by Medley-Wood. The leaves being on the whole larger can probably be explained by their having been collected when the trees were not in flower or fruit; such leaves often being larger than those found on flowering or fruiting branches. Thus Marriott I can now be named *Strychnos Henningsii* Gilg with some degree of certainty.

Regarding Marriott No. II, according to floral characters given in the *Flora Capensis* this is *S. Atherstonei* Harv. It agrees well with the type description and figure in Harvey's *Thesaurus Capensis*. The seed as mentioned above is oblong-globose, slightly compressed and with no sign of the longitudinal channel, only a slight indentation in the centre of one of the slightly flattened surfaces (the mark of the hilum or attachment). The drawing of the seed in the type plate is accurate and the description "peltate" is used in the botanical sense meaning "attached by the surface". Through the courtesy of Prof. H. H. Dixon of Trinity College, Dublin, I was enabled to examine photographs of the material which Harvey had worked on and these supported the above identification. In studying Harvey's notes, however, it is evident that, according to the international rules of nomenclature, the specific epithet must be changed. Prior to Harvey's work Pappe described a plant *Atherstonea decussata*. Harvey, when describing *Strychnos Atherstonei* cites this name in the synonymy of his species saying that he could not find any tangible character on which to separate the plant generically from *Strychnos*. There is no doubt that Pappe's plant is the same species as Harvey's and since the first valid specific epithet must be used it is necessary to employ the combination *Strychnos decussata* (Pappe) Gilg, published in *Engl. Bot. Jahrb.* 28, 121 (1901). Marriott No. II therefore is named as such.

Dealing now with Marriott No. IV which, as mentioned, does not agree with any description of a South African species, it was matched in Pretoria with fruiting specimens collected in the Hlatikulu Forest (*Boocock in National Herbarium* 23199). Later it was matched at Kew with unnamed fruiting specimens from tropical Africa (*Swynnerton* 1071 from Chirinda Forest and *Dawe* 531 from the Kibala Forest). These 4 specimens possessing stiped fruits also have similar leaves which are long-acuminate, shiny on the upper surface and have a tendency to fold along the mid-rib. A further search through the material of *Strychnos* at Kew brought to light a young flowering specimen (*Swynnerton* 125) which also has these characteristic leaves. It is the type of *Strychnos micans* Sp. Moore. The characters and the locality seem to point to its being conspecific with the other specimens mentioned. The description disclosed another character which supports this opinion. The flowers of *S. micans* are described as being 4-merous (most other species are 5-merous in this genus) and the remains of the calyx on all the fruits showed 4 distinct lobes. It seems

justified to assume, therefore, that Marriott IV is *Strychnos micans* Sp. Moore, and if this is so the distribution records of the species have been considerably amplified. The following table summarises the distinguishing characters of the three species investigated :—

STRYCHNOS HENNINGSII GILG**S. DECUSSATA (PAPPE) GILG****S. MICANS SP. MOORE**

(*S. Atherstonei* Harv.).

Fruit oblong-ovoid, not oblique at base, not stipitate; seeds oblong-ovoid, deeply grooved down one side; hilum midway in groove.

Leaves up to 6 cm. long and 2·5–3 cm. wide, elliptic, widest about the middle and gradually narrowing to the apex or somewhat acuminate; tertiary veins obvious on upper surface.

Flowers 5-merous; corolla-tube glabrous or sparsely bearded in throat; lobes glabrous.

Fruit globose or ovoid, oblique at the base, not stipitate; seeds ovoid, slightly compressed; hilum in centre of slightly compressed surface.

Leaves up to 4·2 cm. long and 2·5 cm. wide, obovate, widest above the middle, rounded at the apex or widely and bluntly acuminate; tertiary veins not obvious on upper surface.

Flowers 5-merous, corolla-tube glabrous; lobes densely bearded within.

Fruit globose, not oblique, stipitate; seeds globose, slightly compressed; hilum in centre of slightly compressed surface.

Leaves up to 6 cm. long and 2–3·5 cm. wide, ovate, long acuminate, widest below the middle, long acuminate folding along the mid-rib; tertiary veins usually obvious.

Flowers 4-merous, corolla-tube bearded in throat; lobes glabrous.

THE FLORA OF TRISTAN DA CUNHA: H.M.S. CARLISLE EXPEDITION, 1937.

By R. A. DYER.

Through the courtesy of the British Admiralty, the Union Government was invited early in 1937 to nominate a meteorologist and a botanist to join an expedition to Tristan da Cunha on H.M.S. Carlisle.

The main objects of the expedition were to make a record of conditions in general on the island, with particular reference to the health and teeth of the islanders, to take provisions and mail to the islanders, and to bring away on holiday the Rev. H. Wilde, who had served on the island for three years. During the past 100 years various scientific expeditions have visited the Tristan group of islands, but none made a very lengthy stay. The 1937 visit of H.M.S. Carlisle was no exception in this respect.

Acknowledgments.

The presence of a botanist in the expedition was due indirectly to a suggestion by Mr. P. A. Snell, informally referred to as the Ambassador for Tristan da Cunha at Cape Town. I am personally indebted to Dr. I. B. Pole Evans and Dr. E. P. Phillips for my nomination as botanist. There was scarcely a month in which to prepare for the trip and at the time of notification I had very little knowledge about the Island. I am especially grateful to Captain Marrick, the officers and several members of the company of H.M.S. Carlisle for assistance in various respects which made my efforts more profitable than they may well have been in the circumstances. In view of the opinion of the officers that unusually fine weather was experienced *except for a small gale*, I may state, in part defence of my results, that I was not born to the sea.

The Director of the South African Museum, Capetown, allowed me, with the assistance of Miss S. Garabedian, to consult the botanical specimens collected on Tristan da Cunha by Messrs. Bonomi and Kaytel, and later the Director forwarded on loan to Pretoria important literature. The Director, Royal Botanic Gardens, Kew, arranged for the comparison of my material with the Kew collection and put me in touch with Mr. H. N. Dixon, who has very kindly supplied a complete report on the mosses. The assistance of these and several of my colleagues is greatly appreciated. I shall refer later to the invaluable aid rendered by the islander Arthur Rogers.

A large number of duplicates of the botanical specimens collected on the expedition has been distributed to the more important oversea herbaria, the Royal Botanic Gardens, Kew, having been presented with the first set.

Recapitulation.

Tristan da Cunha is the largest of a small group of islands of volcanic origin in the centre of the South Atlantic Ocean just south of the latitude of the Cape of Good Hope and about 2,000 miles distant from it. It was discovered in 1506 by a Portuguese Admiral who gave it his name. Inaccessible Island and Nightingale Island are within a radius of about 16 miles. Tristan da Cunha is roughly 21 miles in circumference and 6,500 feet

high. Except for the present settlement plateau, $\frac{1}{2}$ –1 mile wide and 50–100 feet in altitude, the island rises precipitously from the sea to an altitude of between 2,000 and 3,000 feet; thence upwards to the summit the rise is more gradual. Vegetation practically ceases above 4,000 feet, due to the lack of soil. The peak of the island is rarely seen owing to the presence of mist almost throughout the year. The rainfall is well distributed and although no exact data are available, the total annual fall must be anything between 50–100 inches on the settlement plateau.

Although over 300 years elapsed after its discovery in 1506 to the date from which permanent colonisation took place, the Tristan group of islands had been the home of various shipwrecked sailors for short periods during the long interval.

The flora of Tristan da Cunha was investigated first in January, 1793 by Aubert du Petit Thouars during a five days' call for watering on the way to the Mascarene Islands. He published his results in 1811 in two papers, "Description abrégée des îles de Tristan d'Acugna" and "Esquisse de la flore de l'île de Tristan d'Acugna" being parts of his "Mélanges de Botanique et de Voyages." This was followed by an excellent account in 1818 by Captain Dugald Carmichael who landed on the island in 1816. He had the advantage of a longer stay than Thouars and his account of the vegetation serves as a reliable basis for comparison with present-day conditions.

H. N. Moseley, Naturalist to the H.M.S. Challenger expedition (1873–76) published what may be looked upon as an interim report on the flora in 1875. MacGillivray and Milne collected earlier in 1852 but their report was not published. Hemsley, in 1885, reviewed the data accumulated up to that date with particular reference to Moseley's report.

Subsequent to this, Gane, Bonomi (1904) and Keytel collected botanical specimens; those of Keytel gathered 1908–1909 were the basis of a paper by Phillips, 1913. The first set of both Bonomi's and Keytel's specimens are in the South African Museum, Capetown. The Report in 1912 on the S.Y. Scotia expedition, 1902–4, which called only at Gough Island, 220 miles to the south, added a little to our knowledge. The botany of the island is mentioned also by Macklin as a result of the visit in 1922 of the "Quest" on Shackleton's last voyage, and by Mrs. Rogers, wife of Rev. Rogers, missionary on the island, 1922–25.

The most recent publication on the flora of Tristan da Cunha is by Christophersen, 1937, who deals principally with a collection of plants made in 1934 by Einar Siggeson. Dr. Erling Christophersen himself sailed to the Tristan group in November, 1937, in charge of a scientific expedition. Unlike previous expeditions his was planned to extend over a period of several months and should result in the accumulation of most valuable data in connection with controversial subjects such as the origin and main affinities of the flora.

Notes on Origin and Affinities of the Flora.

A brief reference to some of the more important views on the origin and present affinities of the flora may be of interest. Although Sir Joseph Hooker did not land at Tristan da Cunha while engaged on his scientific expeditions in the Antarctic about the middle of last century, he considered its flora in the light of Carmichael's results. Dealing with the Antarctic flora as a whole, he pointed out in guarded terms that "the many bonds of affinity between the three southern Floras—the Australian, Antarctic and South African—indicate that these may all have been members of one great vegetation, which may once have covered as large a Southern area as the European does a Northern." Referring to the flora of Tristan da Cunha he found that of the 28 flowering plants then recorded only one species of *Phytica* and one *Pelargonium*, amounting to one-fourteenth of the whole, are Cape forms, whilst seven others, or one-quarter of the flora, are either native of Fuegia or typical of South American botany; and the ferns and lycopodia exhibit a still stronger affinity. He further

pointed out that there are some points in which the vegetation of Tristan da Cunha resembles that of St. Helena and Ascension. This is through the *Phylica* sp. and *Pelargonium* sp. which link the flora with that of the Cape also. However, such important families at the Cape as *Proteaceae*, *Rutaceae*, *Oxalidaceae*, *Crassulaceae*, *Ericaceae*, *Restiaceae* are entirely absent from St. Helena, Ascension and the Tristan da Cunha group, which is in marked contrast to the affinity of the South Western Cape flora with that of Australia.

Schonland, when dealing with the subject of the origin of the Angiospermus Flora of South Africa does not mention the flora of the Tristan group specifically. He does, however, make several pertinent remarks when discussing Hooker's work on the Antarctic flora. "The theory which I formulated is briefly this: At the times when these common types developed, probably in Lower Cretaceous times, possibly even in Jurassic times, there was still a direct land connection between Australia and South Africa, that some of these types were carried to South America by a later connection with Australia and that on the other hand Tropical Africa was able to exchange types of animals and plants with Tropical America up to early Tertiary times, and that in this way a second connection between the South African flora and the flora of America was established."

Hemsley, writing earlier, considered that the flora of the Tristan group consists of 3 or 4 distinct elements, "no one of which sufficiently predominates to justify the assumption that it is essentially the original flora—the facts indicate the former existence of a floral region distinct from America and Australia, and, if not African, at least more closely allied to that than to any other." Personally I consider the weight of evidence against Hemsley's conclusion. He himself concedes that there are probably equally weighty facts against it.

Christophersen, while expressing the view that our knowledge of the phanerogams of Tristan da Cunha is insufficient for phytogeographic discussions of any consequence, draws attention to the relatively low number of endemic species, and "the high number of species of South American or/and New Zealand—Australian distribution, as compared with that of South African distribution." Since the expression of these views he has had the advantage of several months' study of the flora on the island and his conclusions are now awaited with interest.

History of Flora since colonisation.

Before giving the results of my work, I propose to recapitulate briefly from the records of Carmichael, Moseley and Macklin in order to trace the changes which have taken place in the indigenous flora of Tristan da Cunha since the first days of permanent colonisation.

Captain Dugald Carmichael joined the expedition which embarked at the Cape on the 2nd November, 1816, in order to put into effect the decision of the British Government to take possession of the Tristan da Cunha group of islands. Carmichael remained on Tristan da Cunha four months and studied the "natural production of the island." He records that the steep face of the mountain was covered with brushwood mixed with fern and long grass, which, for the most part, hid its native ruggedness. The only plant which approaches to the size of a tree is *Phylica arborea*. At that time it occupied, not only the whole plain (present settlement plateau), but also all parts of the face of the mountain where the roots could "insinuate themselves into the crevices of the rock." Under favourable conditions the *Phylica* grows up to about 20 feet in height, with a crooked twisted stem, 1-1½ feet in diameter. The only other woody plant is the shrublet *Empetrum rubrum*.

Of the herbaceous plants Carmichael points out that the most remarkable is the gigantic grass *Spartina arundinacea*: "It overruns the whole of the island from the upper edge of the tableland down to the sea-shore, accommodating itself to all soils and situations. It springs up in large close tufts, which, when full grown, are borne down by their own weight and lean upon each other in such a manner that a person may roll himself over them without any danger of sinking. Its stems grow to the length of six or seven feet, and are

of a solid, almost ligneous, texture, and are covered with a profusion of leaves. This grass makes an excellent and durable thatch, and the young leaves are eaten by horses and oxen." He continues, "the wild celery (*Apium australe*) grows in abundance over all the low ground and attains a great size, its stem sometimes measuring upwards of three inches in diameter." Of *Acaena sarmentosa* Carm., Carmichael says, "it overruns the low ground, is of no apparent utility, but an intolerable nuisance to such as have occasion to walk over the ground where it grows. Its fruit is a sort of bur, which, on the slightest touch, fixes itself on one's clothes, and falling in a hundred pieces, covers him all over with an unseemly crust of prickly seeds, not to be got rid of without infinite labour."

Carmichael was the first botanist to make an ascent to the summit of the mountain. He noted that the mountain is less precipitous after the initial stiff climb (approximately 2,500 feet), the ground very wet and "studded with tufts of rushy plants that gave way under the slightest pressure." Here also were extensive patches of the fern *Blechnum tabulare* (*Lomaria robusta*) "the stems of which" to use his words, "trail along the ground crossing each other in an intricate manner. This beautiful fern is more generally scattered than most of the others, being found in all moist places, from the table-land down to the plain. The trunk grows to the length of four or five feet, sometimes erect, but usually lying on the ground with its apex only upright."

At about 4,000 feet the soil practically ceases, and consequently vegetation also, except for a few mosses.

In addition to the general account of the vegetation, Carmichael gives a systematic list of the flora in which ecological notes are included. In these supplementary notes he states that the grasses *Agrostis ramulosa* and *A. media* are found on the high part of the mountain forming the chief part of the herbage.

Even in Carmichael's time the northern extremity of the present settlement plateau was denuded of its natural vegetation. By setting fire to the grass the trees were scorched and killed, otherwise it formed an "impenetrable copse."

When Moseley arrived at the settlement 57 years later, the distribution of the flora had already been considerably modified. Unfortunately, owing to unfavourable weather conditions, he had only six hours on the island. When he had reached an altitude of about 400 feet, he was recalled to the ship. "Shrubs" he says, referring to *Phylica arborea* "commence at about 400 feet elevation. There are no trees in this locality, since they have been cut down for firewood, but there is still plenty of wood on the island." *Spartina arundinacea* he found dotted about among the other herbage in rounded tufts of pale bluish green and *Nertera granadensis* (= *N. depressa*) very abundant creeping everywhere amongst the grass. His observations on the flora of Nightingale and Inaccessible Islands proved it to resemble very closely that of Tristan da Cunha. That of the former two islands was at that time, and still is, much less influenced by human interference.

Macklin, a medical doctor, made an ascent of the mountain behind the settlement in approximately the same direction as Moseley. He went considerably higher, however, found abundant vegetation, numbers of ferns, including the tree fern *Blechnum tabulare*, and the tussock grass, *Spartina arundinacea*, mosses, lichens and the island tree. He also found the "dogcatcher" plant *Acaena sarmentosa* referred to by Carmichael.

On another occasion Macklin made an excursion south west from the settlement, past the potato patches, to the cattle and sheep pasturage. To get round the bluff at the end it was necessary for the party to climb up to 2,000 feet. He observed that the vegetation in the gullies is very luxuriant and the grass being sheltered from the wind "grows lush and long." Over a precipice one saw below a long, grassy plain on the "back of the island where numerous semi-wild cattle graze." Going higher they found masses of tree fern and tussock grass and island tree.

Outline of Botanical Programme.

After leaving Simonstown on 23rd February, 1937, H.M.S. Carlisle, under Captain Marrick, anchored off Tristan da Cunha about 9 a.m. on Sunday 28th. In the morning the personnel and equipment were landed and a camp established on the island (Fig. 1). During the day the area near the beach landing stage, and the margin of the settlement plateau leading from it, were botanised for a distance of several hundred yards. Owing to the small size of many of the plants, progress in collecting was comparatively slow.

On the following day, 1st March, a small expedition, consisting of two marines, Arthur Rogers, an islander, and myself, set out with the object of climbing as high as possible up the mountain. We approached the cliffs up a gully about a mile south of the settlement. This must be taken into consideration when reading the floristic data which follow later. At an altitude of 1,500 feet, before the steepest part of the climb was negotiated, rain began to fall and the two marines were left in a rock shelter. With the aid of Arthur Rogers, I climbed 1,000 feet higher, often with a very precarious hold. At about 2,500 feet, with clothes drenched and limbs numb with cold, it seemed prudent not to aspire to greater heights. Collecting specimens was difficult and photography well nigh impossible: both would certainly have been unobtainable at that locality without Arthur Rogers' assistance.

The morning of the next day, 2nd March, was occupied mostly in sorting out and putting into press the saturated material collected on the mountain. In addition, with the aid of a marine, a small collection of marine algae was obtained. The most important species to the islanders is *Macrocystis pyrifera* Ag. "kelp," which grows in great quantity in deep water round the island. The long branches float near the surface checking to a certain degree the force of the waves and preventing the formation of "breakers" except under very rough conditions. It is used as a fertiliser on the potato fields.

An opportunity was made during the afternoon to plant the following grasses taken from the Rietondale Experiment Station, Pretoria:

- Acroceras macrum*, Stapf
- Digitaria swazilandensis*, Stent (Swaziland finger grass.)
- Echinochloa pyramidalis*, Hitchc. and Chase (Limpopo grass.)
- Pennisetum purpureum*, Schum. (Napier fodder.)
- Echinochloa* sp. (Antelope grass.)
- Digitaria scalarum*, Chiov. (Dunn's finger grass.)
- Digitaria* sp. (Pongola River finger grass.)
- Panicum repens*, Linn.
- Panicum coloratum*, Linn. (Makarikari strain.)

These were planted in short rows in Arthur Rogers' garden, with the advice that the grasses which showed promise should be planted out on a more extensive scale in order to improve the pasturage.*

* A preliminary report received from Dr. Christophersen (August, 1938), states that the results up to the time of his departure from the island were not promising. A recent letter from Arthur Rogers states that they are now mostly dead.

In addition to the grasses mentioned, the following trees and shrubs, supplied by the Director of Forestry, were taken to the island for trial. They were planted under the supervision of Mr. N. Ayson, a farmer resident at the Cape, who accompanied the expedition to give advice on agricultural matters in general.*

Timber Trees.	Common Name.	Number.
<i>Cupressus macrocarpa</i> , Hartw.....	Monterey Cypress.....	50
<i>Eucalyptus cornuta</i> , Labill.....	Vate.....	50
<i>Eucalyptus diversicolor</i> , F. Muell.....	Karri.....	50
<i>Eucalyptus gomphocephala</i> , DC.....	Tuart.....	50
<i>Eucalyptus Lehmanni</i> , Preiss.....	Lehmanni.....	50
<i>Phytolacca dioica</i> , Linn.....	Belhambra.....	10
<i>Pinus insignis</i> , Dougl.....	Insignis Pine.....	50
<i>Pinus halepensis</i> , Mill.....	Aleppo Pine.....	50
<i>Pinus canariensis</i> , C. Sm.....	Canary Island Pine.....	50
<i>Pinus pinaster</i> , Soland.....	Cluster Pine.....	50
<hr/>		
Hedge Plants.		
<i>Hakea saligna</i> , Knight.....	Hakea.....	40
<i>Leptospermum laevigatum</i> , F. Muell.....	Australian Myrtle.....	100
<i>Myoporum insulare</i> , R. Br.....	Manatoka.....	100
		700

A quantity of "worms," which constitute a pest in the potato fields, attacking both the aerial growth and tubers, was received from Mr. Green. Some of these survived the journey to Pretoria but none developed further than the crýsalis stage. A moth very like one of the common "cut worm" moths was collected in the grass sward near the settlement.

Special permission was granted by the Captain for me to remain that night on the island. A few sods of grass, including a root of *Spartina arundinacea* were collected on the morning of the 3rd, but no further botanising was done as we were due on board at 7.30 a.m. A few living ferns were also taken on board and are at present in cultivation at the National Herbarium, Pretoria.

Present Conditions.—Details of Botanical Work.

The landing beach is composed of pulverised, black, volcanic rock. The plants nearest high tide level are, *Mariscus congestus* C. B. Cl., *Rumex frutescens* Thouars and *Cynodon Dactylon* Pers. On the steep slope are found forms of *Scirpus Thouarsianus* Schult. *Blechnum penna-marina* Kuhn, a small hardy fern, *Chrysanthemum leucanthemum* L., *Plantago lanceolata* L., *Sporobolus capensis* Kunth and *Gnaphalium luteo-album* L. The moss *Polypodium juniperinus* Hedw. was found in plenty near boulders on the plateau extending to about 1,500 feet altitude. Associated with it on the plateau was an abundance of *Nertera granadensis* Druce (= *N. depressa*) densely matted together with two other small runners, *Hydrocotyle capitata* Thouars and *H. asiatica* L. *Empetrum rubrum* Vahl, and *Blechnum australe* L., which were formerly common in this area, are now rare and poorly developed.

At the head of the waterfall below the settlement is *Holcus lanatus* L. Near the stream is found a variety of plants including, in addition to most of those mentioned above, *Plantago major* L. form ?, *Cotula australis* Hook., *Polygonum aviculare* L., *Cerastium caespitosum* Gillib., *Veronica serpyllifolia* L., *Rumex Acetosella* L. and *Oxalis corniculata* L.

* Dr. Christophersen states that the progress made by the trees up to the time of his departure from the island was promising and a recent report from Arthur Rogers is also encouraging.

In a small area from which sods had been removed not long previously, the following small pioneer annuals were collected: *Senecio vulgaris* L., *Juncus bufonius* L. form, *Cyperus tenellus* L.f. and *Poa annua* L.

Many of the plants listed above have been introduced to the island, mostly unintentionally, and their presence in quantity emphasises the drastic changes which have taken place in the vegetation due to the influence of man. The present settlement plateau which was, in Carmichael's time, covered by an "impenetrable copse" is now covered by a short dense grass sward. It has been grazed off short and very little of it was in flower at the time of our visit. It appeared that *Vulpia bromoides* and *Agrostis* sp. were dominant over a considerable area. Between the garden plots the grass *Poa pratensis* was found with a certain amount of *P. annua*, only the latter, however, being collected in flower. What I took to be *Trifolium repens* L. was frequent in the sward but no flowers were seen to verify the identification.

The excursion up the mountain furnished further evidence of the effects on the vegetation of heavy stocking. The short grass sward, characteristic of the settlement plateau, extended almost unbroken up the gully to an altitude of about 500 feet. At this stage scattered specimens of *Pelargonium grossularioides* Ait., *Acaena sarmentosa* Carm. and *Empetrum rubrum* Vahl occur. Much of the surface of the steep inclines is broken into long parallel steps, the initial causes of which are the combined effects of rain and tramping of animals. The soil is banked up and held in check by a dense mixed growth in which grasses and the fern *Blechnum penna-marina* are most conspicuous. On rocky portions too steep to afford a footing for animals, the vegetation is dense, but the absence of *Phylica arborea* Thouars trees is a notable feature as compared with the early records of its abundance.

At an altitude of about 1,000 feet a boulder outcrop sheltered a solitary small specimen of *Blechnum tabulare*, the island "tree fern" which formerly dominated parts of the settlement plateau. Another fern *Dryopteris aquilina* C. Chr. was also first seen here. On the neighbouring rocky cliffs, regeneration growth of *Phylica arborea* was prominent, but not a large one was to be seen.

The gully is cut off abruptly at about 1,500 feet altitude by a rock shelter. From this point the climb is mostly up a series of semi-perpendicular rock faces. The character of the vegetation changes radically. The grass sward of the lower slopes gives way to a dense growth in which ferns and mosses are dominant. Among the ferns are *Elaphoglossum succisifolium* Moore, fairly rare, *Hymenophyllum aeruginosum* Carm and *Asplenium obtusatum* Forst. var. *crassum* C. Chr. which is often found on otherwise bare rock faces with the roots penetrating the crevices in the weathered surface. *Scirpus Thouarsianus* is, for a short distance, frequently found in this association. Mosses, including the previously unrecorded genus *Sphagnum* and undescribed species are dealt with later. The endemic species *Lycopodium diaphanum* Sweet, grows commonly amongst mosses and liverworts. The abundance of these, often several matted together, is particularly interesting.

Owing to the less disturbed conditions on the mountain slopes, as compared with the settlement plateau, species such as *Hydrocotyle capitata* and *Nertera granadensis*, are more luxuriant. They also grow intertwined with mosses. At about 2,000 feet the first plant of the island celery, *Apium australe* Thouars, was recorded. *Empetrum rubrum* becomes common and more luxuriant. *Blechnum tabulare* has elongated stems and is dominant on many ridges and also in depressions (Figs. 6 and 7). While forcing a passage through a dense community of *Blechnum tabulare*, I noted on the margin of the cliff several flowers of a miniature member of the Compositae, *Lagenophora nudicaulis* Dus. (=L. Commersonii

Cass.). Its small rosettes of leaves rested on a cushion of different coloured mosses and liverworts in which the slender rhizomes were embedded. The minute fern *Hymenophyllum peltatum* Deav. occurs in the same area on the stumps of *Blechnum tabulare*.

The most arduous and dangerous part of the climb is negotiated below about 2,200 feet. Although the mountain rises steeply above this, it is not interrupted so much by perpendicular rock faces. There is an evident accumulation of soil. Grass becomes rank with scattered tufts of Cyperaceae. The only grass in flower was *Holcus lanatus* L., which is not indigenous. The Cyperaceae collected include *Carex Thouarsii* Carm., *Scirpus virens* Boeck., *S. sulcatus* Thouars, *Uncinia breviculmis* Carm. var. *rigida* Kük.

During the ascent only one small plant of *Spartina arundinacea* Carm. was recognised. Small shrubs of *Phylica arborea* appeared to be frequent on certain slopes at about 2,300 feet, but owing to the poor visibility it was practically impossible to distinguish forms even at a short distance. However, except for the eradication of the old trees of *Phylica arborea*, the indigenous flora on the upper slopes of the mountain has not been greatly changed from its natural state.

Arising out of previous statements, a note on soil erosion seems desirable.

Soil Erosion.

The subject of soil erosion on Tristan da Cunha has not been mentioned specifically in earlier literature. That soil erosion has taken place from time immemorial goes without saying. The first settlers built their homes largely of boulders which had fallen from the cliffs in the course of natural erosion. The vegetation was sufficiently dense and firmly established on the rocky slopes and plateau to retard very considerably the progress of erosion. With the advent of man and his domesticated animals and the consequent depletion of the vegetal covering, the progress of erosion was accelerated. The settlers removed the island tree (*Phylica arborea*) for firewood; the stock reduced the flora by grazing and tramping. The absorption power of the soil surface being thus reduced the "run-off" became proportionately greater.

Within the memory of middle-aged islanders, erosion along certain watercourses has assumed extensive dimensions. In Fig. 4 of the stream, which affords the settlement with a permanent water supply, the effect of erosion is clearly seen. The steep-sided watercourse is deep in comparison with the small regular flow of water. A water course to the south of the settlement is much deeper and broader yet it does not have a perennial flow of water. I have no knowledge of the area specially set apart for the grazing of the untamed or "wild" cattle.

Owing to the high rainfall, regeneration of the vegetation under normal conditions is comparatively rapid. Within the immediate vicinity of the settlement area, which is undulating or gently sloping to the seaward margin of the plateau, a short dense sward is dominant. This effectively withstands tramping and prevents the development of sheet erosion. Erosion, however, is likely to loom more seriously on the Tristan horizon than it has up to now, if precautionary measures are not adopted to control grazing on the steep slopes adjacent to the settlement plateau. There are practically no sizeable specimens of *Phylica arborea* in the neighbourhood. The regeneration growth of small shrubs should certainly be protected and not on any account be rooted up for firewood.

BOTANICAL SPECIMENS COLLECTED ON EXPEDITION.

Algae.

Very little time was available for collecting "sea weeds" but in spite of this, with the aid of a marine, the following species were obtained on the rocks below the settlement. The material was identified at the Royal Botanic Gardens, Kew, and the majority of them are new records.

Phaeophyceae.

Macrocystis pirifera (*Turn.*) *Ag.* No. 3617.*

Splachnidium rugosum (*L.*) *Grev.* No. 3605.

Rhodophyceae.

Callymenia Harveyana *J. Ag.* No. 3610.

Dipterosiphonia sp. possibly new. No. 3616.

Epymenia obtusa (*Grev.*) *Ktz.?* No. 3612.

Gymnogongrus polycladus (*Ktz.*) *J. Ag.* Nos. 3606, 3613.

Iridaea ciliata *Ktz.* Nos. 3608, 3609.

Chlorophyceae.

Cladophora flagelliformis (*Suhr.*) *Ktz.* No. 3615.

Enteromorpha sp. No. 3611.

Ulva lactuca *L.* Nos. 3614, 3618.

No. 3607, indeterminate.

Fungi.

Psalliota sp. (*Agaricaceae*, "mushroom").

Only one immature plant was collected just prior to departure. Islanders stated that the "mushrooms" were common at certain seasons during which time they were eaten.

Lichens.

Owing to lack of time, this group was almost entirely neglected. One species collected, however, although widely distributed elsewhere, is a new generic record for the island.

Cladonia pyxidata (*L.*) *Hoffm.* Associated on an old stump of *Blechnum tabulare* with several species of moss about 2,200 feet alt., No. 3579.

Parmelia sp. On *Blechnum australe* stump, about 2,000 feet. alt. No. 3564.

Parmelia sp. possibly *P. saxatilis* (*L.*) *Ach.* On rocks about 1,000 feet alt. No. 3550.

Hepatics.

Several specimens were collected and identifications are still awaited from oversea.

* Collector's numbers are those of the writer.

Mosses.

By H. N. DIXON.

The mosses collected by R. A. Dyer on Tristan da Cunha were received under seventeen numbers, but some of these included several species, and the total amounted to 25 species. Hitherto some 40 species have been recorded from the island.

Of these 25 species, 12 are novelties for Tristan da Cunha, a considerable proportion. Apart from the four new species, the chief interest lies in the geographical distribution of the newly recorded plants. These may be tabulated as follows:—

New Species.

Name.	Affinity.
<i>Blindia brachystegia</i>	<i>B. gracillima</i> Mitt. Kerguelen. <i>B. magellanica</i> Schimp. Fuegia, New Zealand.
<i>Bryum flaccidifolium</i>	<i>B. tenuirete</i> Dus. Guaitecas.
<i>Porotrichum atlanticum</i>	Mascarene or S. American species.
<i>Eurhynchium crassicoatum</i> ined*	

New Records.

Name.	Distribution.
<i>Sphagnum amblyphyllum</i> , Russ.....	Wide.
<i>Rhacomitrium lanuginosum</i> (Hedw.), Brid.	Wide.
<i>Dicranoweisia antarctica</i> (C. M.), Par..	Fuegia; Campbell Is.; New Zealand.
<i>Dicranum aciphyllum</i> (H. f. & W.)....	Temperate S. America; Falklands; S. Georgia; Antarctic.
<i>Dicranoloma imponens</i> (Mont.), Par....	Fuegia.
<i>Dicranoloma Harioti</i> (C. M.) Par.....	Fuegia.
<i>Orthostichopsis subimbricata</i> (Hampe), Broth.	Mascarene Islands.
<i>Leptodontium interruptum</i> (Mitt.), Broth.	Amsterdam I.; New Zealand.

The distribution of these newly recorded species agrees on the whole very well with what is already known of the general affinities of the bryophytic flora of Tristan da Cunha; that is to say a small but appreciable percentage is endemic, a considerably larger proportion sub-antarctic and particularly Fuegian; a very small number distinctly associated with the New Zealand flora, and a still smaller but very marked association with the flora of the Mascarene Islands. One of the most marked features is the almost entire absence of any association with the general African continental flora.

As all the specimens were gathered at or about the same locality, viz. about 2,200 feet altitude under conditions always moist, and at the same date, 1st March, 1937, it has not seemed worth while to repeat these data.

* I have just studied the very large collection of mosses made by the Norwegian Scientific Expedition, 1937-38, which is of remarkable interest. I find that the *Eurhynchium* of which you collected two fragments is a new species (Dixon, 1/4/39).

Sphagnum amblyphyllum, *Russ.* No. 3591. Mr. W. R. Sherrin has examined this, and writes that he does not find it differs from the widely spread plant of the North Temperate zone. The pores are rather fewer than usual, but not more so than may be found in *S. amblyphyllum*. The genus is new to Tristan da Cunha.

Ditrichum conicum, *Mont.* No. 3601b. A few stems only.

Pseudodistichium atlanticum, *Dix.*, forma elata. No. 3586g.

Blindia brachystegia, *Dix.*, sp. nov.

(*Caules* circa 3 cm. alti, caespites sat densos, sericeos, olivaceovirides instruente. *Folia* parum conferta, erecto-patula, sicca parum mutata, 2.5–3 mm. longa, e basi angusta, convoluta, lanceolata sensim tenui-subulata, integra, apice saepe paucidenticulata. *Costa* angusta, ad basin 30–40 μ lata, tenuis. *Cellulae* anguste lineares, infra sensim longiores, parietibus firmis; alares magnae, aetate rubrae, auriculas paullo dilatatas, magnas, decurrentes formantes.

Dioica: *Flores* turgidi, antheridiis magnis. *Perichaetia* turgida, bractae internae e basi lata, convoluta, raptim in subulam contractae. *Seta* perbrevis, cygnea, crassiuscula. *Theca* subglobosa, pachydermica, exothecii cellulis irregularibus, valde incrassatis, apud orem seriebus pluribus transverse rectangularibus, parietibus horizontalibus fortiter incrassatis: *Operculum* altiuscule conicum, rectum. *Annulus* O. *Spori* 20–28 μ . *Peristomii* dentes lanceolati, intense purpurei, fortiter trabeculati.

Hab. alt. 700 m., Tristan da Cunha, 1 Mar., 1937. No. 3594.

Very near to the Kerguelen *B. gracillima*, *Mitt.*, and scarcely differing in the vegetative characters, but markedly distinct in the fruit; the lid there is conico-rostrate, with a long, curved beak, while here it is shortly conical. The spores here also are larger, in *B. gracillima* being 18–22 μ .

B. magellanica differs in the denser foliation, wider leaf base and longer lid.

Dicranoweisia antarctica (*C. M.*), *Par.* No. 3601c.

New to Tristan da Cunha.

Dicranum aciphyllum, *H. f. & W.* Nos. 3592e, 3596. With young and very old capsules, which is noteworthy, as it is a dioicous species.

New to Tristan da Cunha.

Dicranoloma imponens (*Mont.*), *Par.* Sparse in one or two gatherings.

New to Tristan da Cunha.

Dicranoloma Harioti (*C. M.*), *Par.* In several gatherings, and in fair quantity. No. 3586c is a form with strongly falcate leaves, the forma *falcata* of Roivainen (*Syn. Dicranum fuegianum*, *Dus.*). The leaves are usually much shorter in this form than in most of the typical gatherings.

New to Tristan da Cunha.

Campylopus introflexus, *Brid.* No. 3553b.

Leptodontium interruptum (*Mitt.*), *Broth.* Nos. 3589, 3592b and mixed among other gatherings. A very interesting plant, as it is only known from Amsterdam Island and from New Zealand, where it appears to be rare.

New to Tristan da Cunha.

Rhacomitrium crispulum, *H. f. & W.* No. 3601a. This is the *R. membranaceum* of Mitten, but it certainly cannot be separated from the widely spread, subantarctic *R. crispulum*.

Rhacomitrium lanuginosum (*Hedw.*), *Brid.* Nos. 3695c, 3597.

New to Tristan da Cunha.

Macromitrium fimbriatum (*P. Beauv.*), *Schwaegr.* No. 3584.

Bryum flaccidifolium, *Dix.*, sp. nov.

Pseudotriquetra. *Humile*, sordide olivaceo-viride, molle, flaccidum. *B. neodamensi* Itzigs. affine; differt foliis mollioribus, angustioribus, minus concavis, apice obtuso sed minus rotundato, vix cucullato; cellulae parietibus multo tenuioribus, limbo minus definito, costa debiliore.

Fructus ignotus.

Hab. alt. circa 700 m., Tristan da Cunha, 1 Mar., 1937. No. 3587.

Near *B. neodamense*, but more flaccid, with narrower leaves, obtuse, but not rotundate at apex, and scarcely cucullate, with thinner-walled cells and weaker nerve. It is also very near *B. tenuirete* Dus. from Guaitecas, but as figured by Cardot the leaves there are more ovate and slightly narrowed to the obtuse apex, while here they are distinctly elliptic in outline.

Eustichia longirostris (*Brid.*), *C. M.* No. 3586h.

Bartramia sp. No. 3601d. A single stem, of no doubt Section *Vaginella*, but with the sheathing leaf base tapering upwards and passing gradually into the lamina; the cells lowly tubercular almost to base.

Breutelia tenuifolia (*Mitt.*), *Par.* Nos. 3592, 3598b, and among other gatherings, in fact generally mixed with most of the specimens.

Ptychomnion densifolium (*Brid.*), *Jaeg.* Nos. 3595a, 3695d. In several other gatherings also, and showing much variation in size, but without manifesting any tendency to intergrade with other related species.

Orthostichopsis subimbricata (*Hampe*), *Broth.* No. 3586f. A very small quantity. New to Tristan da Cunha, and only known from Madagascar.

Porotrichum atlanticum, *Dix.*, sp. nov.

Frons unica, gracilis, inventa, 4 c.m. alta, parce divisa, divisionibus sat regulariter pinnatis, ramis complanatis, vix 1 cm. longis, 1 mm. latis, iterum parcissime brevissime ramulosis. *Stipes* rigidus, foliis infimis e basi arcissime adpressa brevissime cuspidatis, cuspidate rigide patente acuta; supra magis foliaceis, membranaceis, patulis. *Folia* caulina complanata, sicca estriata, 1-5 mm. longa, valde asymmetrica, ovata, breviter acutata, acuta, uno margine plano, altero inflexo, superne argute, haud grosse, subdistanter inaequaliter denticulato. *Costa* tenuiuscula, circa $\frac{3}{4}$ folii longitudinem attingens. *Cellulae* inferiores lineares, breviusculae, supra sensim breviores et latiores, superiores omnes breviter rhomboideae, $2-3 \times 1$. *Folia* ramea multo minora, subcomplanata, costa debiliore, cellulis paullo brevioribus, cetero subsimilia.

Cetera ignota.

Hab. Circa 700 m. alt., Tristan da Cunha, 1 Mar., 1937, No. 3592f.

The position of this (whether in *Porotrichum* or *Thamnum*) is rather doubtful. *P. valdiviae* (*C. M.*) *Mitt.*, from Chile, closely resembles it, but has narrower leaves, and all the stipes leaves foliaceous, etc. The Mascarene *Pinnatella tamariscina* (*Hampe*) *Broth.* is much like it in leaf form, but the habit is very different, and the leaves broader and rounder in outline.

Thuidium curvatum (Mitt.). Nos. 3595f, 3599. A rather remarkable form (3595c), is much more robust and rigid than most of the specimens, the leaves all larger and less incurved when dry as well as when moist; the stem leaves especially with long, rigid subulae, widely divaricate when dry and slightly recurved. Most of the specimens of the species that I have seen from the island are very much alike, small and slender with all the leaves (stem and branch) small and similarly incurved-catenulate when dry. If the Tristan plant is truly distinct, then this form is well worth a varietal name. But I strongly suspect that it is not specifically different from the New Zealand and South American *T. furfurosum*, which in its slender forms [*T. sparsum* (H.f. & W.) Jaeg.] very closely resembles, to say the least, the Tristan da Cunha plant. If this is the case, then the form referred to is but a slight divergence from the type compared with the many and varied forms which *T. furfurosum* exhibits.

Drepanocladus uncinatus (Hedw.) Warnst. Nos. 3598a, 3589, etc.

Eurhynchium crassicoatum Dix. ined. Nos. 3593, 3592d.

New to Tristan da Cunha.

Hypnum cupressiforme (Hedw.) Brid. No. 3586b. A curious form, most of the leaves being straight, and with small alar cells; in this condition it is very unlike the typical plant. A few leaves here and there, however, are falcate, and have the larger, characteristic lower alar cells, thus revealing its identity.

Polytrichum juniperinum Hedw. No. 3553.

Ferns.

No new records were made in this group.

Hymenophyllum aeruginosum, Carm. Frequent at the base of larger ferns, e.g. *Blechnum tabulare*, and amongst moss, not readily observed owing to small size, 2,000–2,400 feet alt., No. 3558.

H. peltatum, Desv. On old stump of *Blechnum tabulare* mixed with moss, possibly frequent but less readily observed than *H. aeruginosum*, about 2,200 feet alt., No. 3582.

Polypodiaceae (Alphabetical list).

Asplenium obtusatum, Forst. f. var. **crassum** C. Chr. Scattered on bare rock faces without soil, and occasionally growing in leaf mould with mosses, 1,500–2,000 feet alt., No. 3561.

Blechnum australe, L. Rare on steep rocky slope from landing beach to the settlement, No. 3522, frequent elsewhere in gullies according to islanders.

Blechnum penna-marina, Kuhn. Frequent on steep and precipitous slopes and rock faces, often forming dense consocieties or associates with *Elaphoglossum laurifolium*: prevents excessive soil erosion in parts by the binding effect on the soil of its dense rhizomatous growth, 30–1,500 feet alt., No. 3521.

Blechnum tabulare, Kuhn. (the island "tree fern"). Rare between rocks at 1,000 feet alt. and nearly stemless; at 2,000 feet alt. it becomes dominant in parts on ridges and in some depressions, about 3–4 feet tall, sheltering a wealth of moss, lichen and *Hymenophyllum* spp., sterile fronds more rigid than the South African form and the pinnae with somewhat revolute margins, No. 3555. In Thouars' and Carmichael's time *Blechnum tabulare* was common on the settlement plateau with *Phyllica arborea* the "island tree."

Dryopteris aquilina *C. Chr.* Occasional to frequent, stemless or with short thick stem, among rocks, some fronds $2\frac{1}{2}$ –3 feet long, 600–1,000 feet alt., No. 3554.

Elaphoglossum laurifolium, *Moore*. Fairly rare on steep rocky slopes with moss, etc., 6–15 ins. tall, about 2,000 ft. alt., No. 3557.

E. succisifolium, *Moore*. Frequent on rockfaces in dense associates with *Blechnum penna-marina*, 6–12 ins. tall, 1,000–1,500 ft. alt., No. 3556.

Gymnogramma cheilanthoides, *Sw.* Apparently rare, growing with moss and other small ferns, about 2,000 ft. alt., No. 3578.

Polystichum adiantiforme, *J. Sm.* Apparently rare, on steep rocky slope with moss and fern, about 2,000 ft. alt., No. 3562.

Vittaria stricta, *Carm.* (*Vittaria vittarioides* *C. Chr.*). Apparently rare, on steep rocky slope with moss and fern, about 2,000 ft. alt., No. 3559.

Lycopodiaceae.

Lycopodium diaphanum *Sw.* Frequent on steep slope amongst moss and other short dense growth, long lateral branches penetrating moss and rooting at the nodes, 2,000–2,300 ft. alt., No. 3563.

Flowering Plants.

Among the phanerogams the following six are recorded for the first time. Almost certainly all of them were introduced by man.

Cynodon Dactylon (L.) Pers.

Cyperus tenellus L.

Juncus bufonius L. form.

Polygonum aviculare L.

Plantago major L. form.

Veronica serpyllifolia L.

These were all growing within a radius of a few yards on the margin of the settlement plateau between the settlement and the beach landing stage. At least two were collected previously by Keytel, but owing to his poor material, they were not definitely identified. Keytel's specimens, tentatively named *Scirpus cernuus* and *Nertera assurgens* are, respectively, *Cyperus tenellus* and *Veronica serpyllifolia*. In view of Christophersen's remarks about the poor condition of some of Einar Siggeson's specimens, it is possible that he also may have collected some of the above-mentioned species in an unrecognisable state.

Of these newly recorded species the most important one economically is *Cynodon Dactylon*. It has taken a firm hold on the sand above high water level near the landing stage and is also spreading on the margin of the settlement plateau. Owing to its aggressive character it will, in due course, no doubt make a bid for dominance over the settlement plateau. It is likely to prove an asset in the work of preventing and checking soil erosion and at the same time is a useful addition to the fodder plants on the island.

Gramineae.

Agrostis simulans *Hemsl.* Apparently frequent in sward of the settlement area but not many specimens in flower, probably owing to grazing, No. 3534. In association with other species of grass not in flower, forming dense sward on small ridges of mountain slope, leading up gully, up to 1 foot high with protection, 500–1,000 feet. alt., No. 3551.

Mr. C. E. Hubbard, Kew, reports—"Nos. 3534 and 3551 probably represent the same species as *Agrostis simulans* Hemsley from St. Helena. The degree of development of the awn on the lemma appears to be very variable; in some cases it may be represented by a minute point only, whereas in others it is comparatively long. *Agrostis Helenae* Steud. may be an earlier name for the species but the type has not been examined."

Cynodon Dactylon Pers. (First record.) Producing vigorous growth with strong runners, frequent on steep slope from landing beach above high water level and on margin of settlement plateau, No. 3540.

Holcus lanatus L. (Yorkshire Fog). Scattered on slope from the beach but not much in flower: dense clump in flower at top of the waterfall below the settlement, No. 3525. Up mountain about 1 mile south of settlement associated with several species of Cyperaceae, 9-18 inches high, 2,300-2,400 feet alt., No. 3570.

Poa annua L. Frequent in a small area near the margin of the settlement plateau and elsewhere, No. 3530.

Poa pratensis L. Not in flower, sod containing it collected in the settlement area and grown at the National Herbarium, Pretoria, where it flowered in October, 1937, No. 3625.

Spartina arundinacea Carm. (Tussock grass, thatch grass.) An isolated young tuft 18 inches high, about 1,000 feet alt., No. 3576. Cultivated in Fred Rogers' garden for repairing thatch, 6-7 feet high, No. 3577.

When Thouars and Carmichael arrived it overran the whole of the island from the upper edge of the settlement area down to the sea shore.

Sporobolus capensis Kunth [*S. indica* Auct. non (L) R. Br.]. Densely tufted on slope from landing beach, frequent, about 15 inches tall, No. 3541. On margin of settlement plateau, about 20 inches tall, No. 3541a. The difference in growth of the two collectings was apparently due to the better soil condition of the latter.

Vulpia bromoides Gray. In damp depressions below the settlement towards the beach, common in the sward but not much in flower, a grass of fine texture, culms 4-8 inches high, No. 3533.

Cyperaceae.

Carex Thouarsii Carm. Occasional in dense tufts on margin of "tree fern" *Blechnum tabulare* consociates with other species of Cyperaceae and the grass *Holcus lanatus*, about 18 inches high, 2,300-2,400 feet alt., No. 3572.

Cyperus tenellus L. (first record). Near margin of cliff below the settlement; one of the pioneers in a small area where turf had been removed, annual about 2 inches high, No. 3523.

Although recorded here for the first time, it was collected by Bonomi (1904) and probably Keytel (1908-9) as discovered by comparison with specimens in the South African Museum, Capetown. These specimens in the S.A. Museum were placed tentatively under *Scirpus cernuus* Vahl. var. *subtilis*. In view of this it would be advisable to check the identification of earlier collectings from Tristan da Cunha named as *S. cernuus* in other herbaria.

Mariscus congestus C. B. Cl. (*Cyperus congestus* Vahl.). Frequent on black, sandy volcanic soil above landing beach, with grass, forming tufts with short rhizomes, 9-18 inches high, No. 3542.

Scirpus sulcatus Thouars. Scattered in dense growth of other species of Cyperaceae and grass, near "tree fern" *Blechnum tabulare* consociates, in tufts 9-18 inches high, 2,300-2,400 feet alt., No. 3574.

S. Thouarsianus Schult. Frequent in dense tufts and mats on rock faces, with little or no soil, 2-3 inches high, about 1,500 feet alt., No. 3571.

S. Thouarsianus Schult. var. **bicolor** Hemsl. On rock faces and in tufts with short runners in grass near boulders on the settlement plateau towards the beach, frequent, No. 3543.

S. virens Boeck. Apparently comparatively rare in dense growth of other species of Cyperaceae and grass, near "tree fern," *Blechnum tabulare* consociates; in tufts about 9 inches high, 2,300-2,400 feet alt., No. 3573.

Until the above identification was received from Kew, I did not associate this specimen very closely with **S. Thouarsianus**. My material of the latter has only a few, and those poor, spikelets, which look very distinct from the comparatively large dense ones of my No. 3573 (*S. virens*). The habit of the plants is also different and it is only on detailed examination that the points of similarity become evident. Whether it should be considered as a variety of *S. Thouarsianus* as done by Hemsley is one of the problems which was to engage Dr. Christophersen's special attention. In addition to the differences in habit the dissected specimens of my 3573 usually had two style branches united only near the base and three stamens: those of 3571 had the style branches further united and only two stamens. The glumes of the latter were narrower and more thickened down the back.

Uncinaria brevicaulis Thouars var. **rigida** Kük. Occasional in grass with other cyperaceous growth, near margin of "tree fern" *Blechnum tabulare* consociates, in tufts 18 inches—2 feet high, 2,300-2,400 feet alt., No. 3575.

Juncaceae.

Juncus bufonius L. forma (new record). On margin of settlement plateau towards sea, pioneer on small cleared area, apparently an annual, No. 3524.

Juncus tenuis L. On margin of settlement plateau towards sea, in grass near stream, occasional to frequent in small tufts, No. 3526.

Polygonaceae.

Polygonum aviculare, L. (introduced; new record). Near margin of cliff below the settlement, evidently only recently introduced, No. 3529.

Rumex Acetosella L. On margin of cliff below the settlement in short grass and on stream bank, rather dwarf, frequent but not much in flower, No. 3519. Mixed with grass, moss, etc. on mountain slope, up to 18 inches high; 2,000 feet alt., No. 3580.

Rumex frutescens Thouars. Near sea shore and near the settlement stream, frequent, with tough, short or straggling stem up to about 1 foot long, No. 3518.

Caryophyllaceae.

Cerastium caespitosum Gilib. Occasional near margin of the settlement plateau in grass, No. 3532.

Rosaceae.

Acaena sarmentosa Carm. (= *A. sanguisorba* Auct.). Procumbent sub-shrub in grass with *Empetrum rubrum*, fruiting stage past, 500-1,500 feet alt., No. 3549.

Leguminosae.

Trifolium repens L. Noted in grass, not in flower and not collected.

Oxalidaceae.

Oxalis corniculata L. On margin of the settlement plateau, occasional in grass, No. 3535.

Geraniaceae.

Pelargonium grossularioides (L.) Ait. (= *P. acugnaticum* Thouars). Frequent in grass with *Empetrum rubrum* and *Acaena sarmentosa*, evidently grazed somewhat by stock, procumbent, fl. pink, 500–1,000 feet alt., No. 3547.

Empetraceae.

Empetrum rubrum Vahl (Island berry used for pies). Small Erica-like shrub with spreading branches, rare on margin of cliff below the settlement, where it was formerly common; not in fruit, No. 3520. Frequent on steep slope in grass with *Acaena sarmentosa*, in fruit, berries sour, red to black on same plant, 500 feet alt., No. 3548. In dense grass near *Blechnum tabulare* associates, berries very plentiful, 2,300 feet alt., No. 3567.

Rhamnaceae.

Phylica arborea Thouars (the island tree). Shrub up to about 6 feet high (formerly up to 20 feet in this area), now only regeneration growth on rocky slope, No. 3552.

Umbelliferae.

Apium australe Thouars (island celery). On steep slopes in dense fern and moss growth, 1–1½ feet high (formerly abundant and more luxuriant) about 2,000 feet alt., No. 3568.

Hydrocotyle asiatica L. Runner in short grass near margin of the settlement plateau, occasional to frequent in patches, No. 3537.

H. capitata Thouars. Runner with short internodes, in dense patches with grass and *Scirpus Thouarsianus* var. on margin of the settlement plateau, No. 3538. In dense moss and *Lycopodium* growth, much more luxuriant than specimens collected near the settlement, about 2,000 feet. alt., No. 3566.

Scrophulariaceae.

Veronica serpyllifolia L. (new record but collected previously = Keytel 1822 in S. Afr. Museum, Capetown). Small diffuse herb in grass near stream and occasional as a pioneer, on moist bare soil with *Plantago lanceolata* and *Cynodon Dactylon*, minute mauve flowers, No. 3536.

Plantaginaceae.

Plantago lanceolata L. Common on margin of cliff below the settlement area and on steep slope from the landing stage, varying considerably in height according to the situation, No. 3546.

P. Major L.? On margin of the settlement plateau, in small area, dwarf herb 2–4 inches high, apparently perennial, No. 3531. The specimens probably represent a form of this variable species although considerably smaller than plants growing in other countries under favourable conditions.

Rubiaceae.

Nertera granadensis (L. f.) Druce (= *N. depressa* Banks and Sol.). Frequent on margin of settlement plateau towards the landing beach, small runner rooting at nodes, forming dense patches in grass and near boulders, with many red berries, No. 3539; mixed with moss on mountain side, not in fruit as near coast and not in dense mats, about 2,000 feet alt., No. 3581.

The specimen collected by Keytel, tentatively named as *N. assurgens* Thouars, is *Veronica serpyllifolia* L.

Compositae.

Chrysanthemum leucanthemum *L.* Frequent on slope leading from beach landing place and along the settlement watercourse above waterfall; leaves either nearly entire or deeply pinnate, plant from almost stemless up to 1 foot high, No. 3544.

Cotula australis *Hook.* Occasional on margin of grass sward near the settlement stream, No. 3528.

Gnaphalium luteo-album *L.* Frequent in parts on margin of cliff below the settlement plateau, 3-12 inches high, No. 3545.

Lagenophora nudicaulis *Dus.* (= *L. Commersonii* Cass.) Delicate herb producing slender runners amongst mosses and *Nertera granadensis*, flower mauve, evidently rare, only one small colony found, 2,300 feet alt., No. 3569. The discovery and collection of this minute rarity was one of the "highlights" of the climb in the drenching rain.

Senecio vulgaris *L.* Pioneer annual 3-9 inches high in small clearing on the settlement plateau, near cliff, No. 3527.

Sonchus oleraceus *L.* was observed in a garden but not collected.

COMPOSITION OF FLORA.

	Phanerogams. (Flowering Plants.)		Cryptogams.						
	Indi- genous.	Intro- duced.	Ferns.	Mosses.	Liver- worts.	Lichens.	Fungi.	Algae.	Total.
Prior to "Car- lisle" expedi- tion.....	42	32	30	38	11	12	2	19	186
Present record ..	42	38	30	50	11 ?	13	3	25 ?	±212

SUMMARY OF RESULTS.

- (1) Several new records of "sea weeds" (Algae) were made.
- (2) One lichen was a new generic record for the island.
- (3) Among the mosses collected were four novelties and eight additional new records for the island.
- (4) Six flowering plants were recorded for the first time, all of which were probably accidentally introduced to the island within recent times.
- (5) Soil erosion is on the increase on the settlement plateau and the problem of combating it should be seriously considered.
- (6) Selected species of grass and trees from the Union Department of Agriculture and Forestry were planted on the island as an experiment.
- (7) Composition of flora (see table above).
- (8) Illustrations.

BIBLIOGRAPHY.

(SEE NOTE UNDER GANE.)

- Carmichael, Dugald..... "Some account of the Island of Tristan da Cunha and of its Natural Productions," Trans. Linn. Soc., Vol. 12, 1818.
Biographical Notice of the late Capt. Dugald Carmichael, F.L.S. in Hook. Bot. Misc. 3, 1833.
- Christophersen, E..... "Plants of Tristan da Cunha." Sci. Res. Norw. Antarct. Exped. 1927-28, No. 16, 1937.
- du Petit-Thouars, Aubert..... "Esquisse de la flore de l'isle de Tristan d'Acugna," in Mélanges de Botanique et de Voyages, 1811.
- Gane, D. M..... Tristan da Cunha. London, 1932 (including a comprehensive bibliography, mostly of a non-botanical nature).
- Hemsley, W. B..... "Report on the botany of the Bermudas and various other islands of the Atlantic and Southern Oceans," pt. 2, Rep. Sci. Res. Voy. Challenger, Botany, Vol. 1, 2, 1885.
- Hooker, Sir Joseph..... Botany of the Antarctic Voyage, 1847.
- Moseley, H. N..... "Notes on Plants collected in the Islands of the Tristan d'Acugna group," Journ. Linn. Soc. Bot., Vol. 14, 1874.
- Officers of H.M.S. "Carlisle"..... "Tristan da Cunha in 1937," The Geog. Mag., Vol. 6, Nov., 1937.
- Phillips, E. P..... "A list of the phanerogams and ferns collected by Mr. P. C. Keytel on the island of Tristan da Cunha, 1908-1909," Ann. S. Afr. Mus., Vol. 9, 1913.
- Rogers, Rose A..... The Lonely Island, London, 1926.
- Schonland, S..... "A Study of some facts and theories bearing upon the question of the origin of the Angiospermous Flora of South Africa," Trans. S. Afr. Phil. Soc. 18, 1907.
- Wild, Commander Frank..... Shackleton's Last Voyage. London, 1923 (including botanical notes by Dr. Macklin.
Report on the Scientific Results of the Voyage of S.Y. Scotia during the years 1902, 1903, 1904, Botany 3, 1912.

ILLUSTRATIONS.

(PHOTOGRAPHS BY THE AUTHOR.)

- (1) Settlement of Edinburgh on N.-W. of Tristan da Cunha.
- (2) Approach to the settlement from landing beach: this area was covered by an "impenetrable copse" in 1816, according to Carmichael: island cattle and young bull landed by H.M.S. Carlisle: erosion in background.
- (3) Landing beach, with severely eroded slopes in the background.
- (4) Settlement stream with steeply eroded banks: in background New Zealand flax (*Phormium tenax* Forst.) cultivated in a garden for thatching.
- (5) Cottage roof thatched with *Spartina arundinacea*, pieces of turf along the top to prevent leakage during storms: (New Zealand flax is cultivated and also used for thatching, see Fig. 4).
- (6) *Blechnum tabulare* on precipitous slopes at about 2,400 feet alt. (heavy rain at the time).
- (7) *Blechnum tabulare*, as in Fig. 6, near view, with Arthur Rogers.



Fig. 1.—Settlement of Edinburgh on N.W. of Tristan da Cunha.

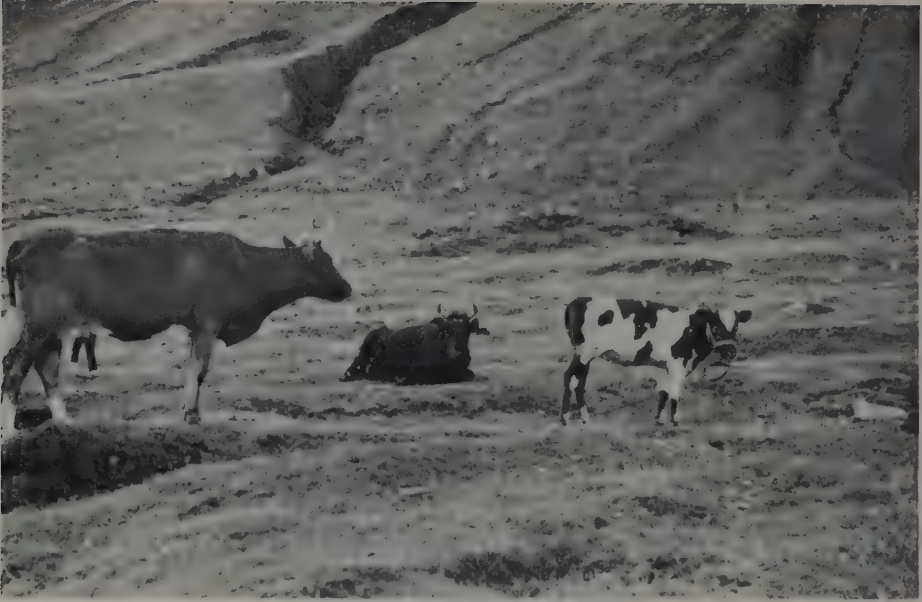


Fig 2.—Approach to settlement from landing beach: this area was covered by an “impenetrable copse” in 1816, according to Carmichael: island cattle and young bull landed by H.M.S. Carlisle: erosion in background.



Fig. 3.—Landing beach, with severely eroded slopes in the background.



Fig. 4.—Settlement stream with steeply eroded banks: in background New Zealand flax (*Phormium tenax* Forst.) cultivated in a garden for thatching.



Fig. 5.—Cottage roof thatched with *Spartina arundinacea*, pieces of turf along the top to prevent leakage during storms: (New Zealand flax is cultivated and also used for thatching, see Fig. 4).



Fig. 6.—*Blechnum tabulare* on precipitous slopes at about 2,400 ft. alt. (heavy rain at the time).



Fig. 7.—*Blechnum tabulare*, as in Fig. 6, near view, with Arthur Rogers.

A REVIEW OF THE GENUS *ADROMISCHUS* LEMAIRE.*

By C. A. SMITH.

[Indexed at end of the Article.]

The genus *Adromischus* was first described by Lemaire (Jard. Fleur. II. Misc. 59) in 1852, two species—*A. robustus* and *A. mucronatus*—being described by him for the first time, and nine species, originally described by their authors under *Cotyledon* Linn., were transferred [according to Berger (¹)] by Lemaire to his new genus. These species all had in common a dwarf habit and a spicate or racemose arrangement of the usually erect flowers round the upper part of the elongated and scape-like inflorescence-rhachis in 1—2—3-flowered cymes, characters which these species do not share with typical species of *Cotyledon* Linn. (emend.) and which were utilised by Harvey (²) about 10 years later, when he monographed the known South African species of the genus for the first time, for his Sect. *Spicatae*. Under this section Harvey (²) described *Cotyledon Zeyheri* Harv., and redescribed *C. hemisphaerica* Linn., *C. cristata* Haw. and *C. mammillaris* Linn. f., the incorrectness of his treatment of these species being noted further on under their respective heads. Five species, which really also belong to this section, were further enumerated by Harvey (²) under the "Imperfectly known and doubtful species," and he seems to have been quite ignorant of Lemaire's paper, for he does not refer to the two species described by Lemaire under *Adromischus*, nor to this generic name. Harvey certainly appears to have regarded the characteristic inflorescence features as having no more than sectional value.

The same state of affairs seems to have obtained among all later authorities, for example Dr. S. Schonland in his several papers on the South African species of *Cotyledon*. No reference to Lemaire's article is found until the late Professor Alwin Berger monographed the *Crassulaceae* (¹), vol. 18. Here Berger resuscitated Lemaire's generic name and gave the transferences of eight additional species, seven of which had been described under the generic name *Cotyledon* in recent times, so that the genus *Adromischus* Lem., as circumscribed by Berger (¹), then stood accredited with 15 species, Lemaire's two species being held by Berger to be conspecific with two previously described plants. In the present paper, the ^{written} ^{thus} ^{agreed} by ^{H. G. G. G.} ¹⁵ to Berger's total, either as hitherto undescribed species, or as new transferences, or new names, together with critical notes on some of the older species, as well as including three from other German authors and not previously referred to.†

* This paper was completed in the year 1938, and references to some of the later authors, e.g. von Poellnitz, have been inserted by the Editor. (See also Appendix.)

† The latest area to yield an interesting series of species new to botanical science, is South-West Africa, where Dr. Kurt Dinter has been responsible for the discovery of these novelties. Thus the present article has included four from that Territory, but it would appear from current publications that correct identification of the species (judging from the descriptions published) is as rare as imaginative nomenclature for the species.

As re-circumscribed for purposes of this paper, the genus presents the following outstanding characteristics :

1. The stems are succulent in all species, though variously developed, being frequently very dwarf [*A. nanus* (N. E. Br.), *A. cristatus* (Haw.), *A. rupicolus* *], usually about 10 cm. high, seldom up to 90 cm. (*A. kleiniioides*) and rarely obsolescent [*A. humilis* (Marl.), *A. Schaeferianus* (Dtr.)] though one is described as a semi-shrub (*A. montium-Klinghardtii*).

As a rule they are unbranched, though a number have a few very short and stubby or podgy branches [*A. hemisphaericus* (Linn.), *A. umbraticolus*, *A. rotundifolius* (Haw.)], while at least one [*A. caryophyllaceus* (Burm. f.)], is very distinctly branched, and are erect and suffrutescent, being very rarely prostrate and rooting at the nodes [*A. mammillaris* (Linn. f.)].

In almost all species the stems are devoid of a hairy indumentum, but *A. cristatus* (Haw.) and *A. clavifolius* (Haw.) are unique in the possession of numerous short and closely interwoven reddish- to rusty-brown rather coarse and curly "aerial roots" which have water absorptive properties, according to Marloth. Such species as *A. hemisphaericus* (Linn.), *A. festivus*, etc., are frequently found with tufts of adventitious roots arising from the cauline nodes, but these should not be confused, at least as to function, with the aerial roots of the two former species. A true hairy indumentum occurs only in such species as *A. Schaeferianus* (Dinter), *A. leucothrix*, *A. Zeyheri* (Harv.), in which the leaves and inflorescence are pubescent or hispid, while in *A. cristatus* (Haw.) and *A. clavifolius* (Haw.) only the leaves are softly pubescent. In nearly all species of the genus, also, the younger parts at least are densely covered with a whitish bloom caused by a waxy secretion, this no doubt playing an important part in reducing transpiration losses.

The leaves, which are invariably thick and fleshy, are either alternate and closely crowded (or scattered), or opposite—see examples in sectional groups below—or rosulate [*A. humilis* (Marl.)], and, in several of the species, are beautifully spotted or blotched with purple to chocolate-brown flecks and dots—*A. festivus*, *A. Cooperi* (Baker), *A. Marianae* (Marl.), *A. tricolor*, *A. fusiformis* (Rolfe), *A. maculatus* (Salm Dyck), the spots or blotches usually flowing into an irregular and larger blotch under the apical margin. (Here may incidentally be noted that this blotching of the leaves is by no means so variable as some authorities have assumed.) In shape the leaves vary from flat and obovate-cuneate, e.g. *A. rhombifolius* (Haw.), *A. rotundifolius* (Haw.), *A. sphenophyllus*, to orbicular or sub-orbicular or reniform, e.g. *A. rupicolus*, *A. nanus* (N. E. Br.), to fusiform or spindle-shaped, e.g. *A. kleiniioides*, *A. fusiformis* (Rolfe), *A. tricolor*, ovoid- to subglobose and terete in cross-section, e.g. *A. mammillaris* (Linn. f.), semiglobose [*A. hemisphaericus* (Linn.)], oblong or oblong-elliptic and semiterete in cross-section [*A. Marianae* (Marl.)], sometimes with a deep sulcus on the upper face (*A. leucothrix*). In all these the leaves are always distinctly sessile, but, on the other hand, *A. festivus*, *A. pachylophus*, *A. Zeyheri* (Harv.), *A. cristatus* (Haw.) and *A. clavifolius* (Haw.), share the unique property of having their much thickened terete to semiterete leaves narrowed from about the middle or lower third of their length into a distinct much thinner terete "petiolar" portion, the apices being flattened and crisped or undulate. In *A. Cooperi* (Baker), and *A. pachylophus*, in the apical part of the subcylindric leaves is flattened and expanded into an ovate or ovate-rotundate broader part, which is also a unique character in the genus, and to which the specific epithet of the latter refers.

The inflorescence invariably partakes of the nature of a typical spike or true raceme, though a hard and fast line cannot be drawn between groups of species on this score alone, since the flowers may be sessile even when mature, but become distinctly pedicelled in the fruiting stages. In their arrangement the flowers appear more usually to be singly disposed

* Specific names cited without an author's name are new, and are accompanied by descriptions or validating references further on.

along the rhachis, which is most generally unbranched, but 3-flowered sessile or subsessile cymules occur in the lower half of the inflorescences of such species as *A. kleinioides*, *A. triflorus* (Linn. f.)—the specific epithet here being self-explanatory—*A. Alstoni* (Schonl. and Bak. f.), and *A. sphenophyllus*, typically so in the first two, and from 1-3 in the last two, whereas in *A. maculatus* (Salm Dyck) the number varies from 1-2 (so far as seen), though here the 1-flowered condition would appear to be the more usual.

Two well marked conditions of flower colour occur in the genus, the Little Namaqualand and Little Karoo species having striated green corolla-tubes with salver-shaped limbs which are either bright scarlet above and below or white above and scarlet to wine red on the lower face, while the more northerly species (i.e. those found north and, in the N.E., just south of the Orange River), have purple corolla-tubes and dull purple limbs which become completely reflexed over the apical part of the former, the throat being very generally of a richer and deeper purple.

The leaves of several (if not all) species are capable of rooting from the base [*A. umbraticolus*, C. A. Sm., *A. rupicolus*, *A. Marianae* (Marl.)], and in course of time will give rise to a new plant thus affording a ready method of propagation.

It would seem that at least some of the species of the genus are toxic to stock, an undetermined species from Namaqualand [probably *A. Alstoni* (Schonl. & Bak. f.)], being reported from that area as causing the so-called "krimpsiekte" in goats, while experimental feeding tests carried out with *A. umbraticolus* C. A. Sm. at Onderstepoort Veterinary Research Laboratories (near Pretoria), have shown this species to be fairly toxic with the development of cotyledonotoxin poisoning symptoms (*Cotyledonosis*), closely resembling those seen in animals poisoned by species of "true" *Cotyledon*.

Many of the species have already been accurately figured in colour (sub. gen. *Cotyledon*), though several of the plants represented by these rather excellent plates have been erroneously identified, as a glance through the synonymy given under each species below (e.g. *A. sphenophyllus*, *A. kleinioides*) will show, and it is not surprising to note that several of the older "Flora Capensis" species, in the light of critical examination, are at present known only from the type gathering [*A. Zeyheri* (Harv.), *A. filicaulis* (E. & Z.), *A. trigynus* (Burch.), *A. triflorus* (Linn. f.)]; some only from description [*A. rhombifolius* (Haw.)], the type being apparently non-existent; some only from a figure [*A. hemisphaericus* (Linn.), *A. Cooperi* (Baker), *A. kleinioides*, *A. fusiformis* (Rolfe)], of which the original specimens were apparently never kept, while yet other species have only been re-discovered once or thrice [*A. maculatus* (Salm Dyck), *A. caryophyllaceus* (Burm. f.), *A. mammillaris* (Linn. f.), *A. hemisphaericus* (Linn.), the first in 1908, 1926 and 1930, the second in 1878, the third in 1926 and 1930, and the last in c. 1824].

Many of the older species were prime favourites in European hot houses and all these were described in the first instance from cultivated plants, the earliest known species (as to actual date of publication) being *A. hemisphaericus* (Linn.), which was in cultivation in Sherard's famous garden at Eltham, near London, prior to 1737, when it was accurately figured and described by Dillenius, Linnaeus subsequently (1762) naming the species from this plate, while *A. caryophyllaceus* (Burm. f.) was figured by the elder Burmann in 1738, and named from this plate by the younger Burmann in 1768. There is however, a great deal of indirect evidence for believing that the elder Burmann figured the plant before Dillenius figured his, Burmann's figure being practically no more than a copy of a plate executed in colour at the Cape during the time of the elder v. d. Stel's governorship, i.e. prior to 1699, and contained in the famous Codex Witsenius, which was never published, but came to Burmann's hands via the Commelins. Thus he quotes that the plant "*A. Casp. Commel. in Catal. MSto ad Cod. Wits. vocatur Sedum Africanum montanum, foliis orbiculatis, floribus parvis, variegatis; & in Cod. Wits. Sedum Africanum montanum, minus, folio rotundo, flore ex rubro & albo variegato, ubi & dicitur quod in montibus*

crescat inter rupium fissuras, florens Novembri." He also gives synonyms from Boerhaave and Tournefort, as well as "*Cotyledon Africanum*, foliis oblongis, floribus umbellatis, fibrosa radice, *Oldenl.* (sphalm. *Olendenl.*) *Catal. Plant. Afric.* p. 27," while Plunkenet's (*Mant.* p. 169) "*Sedum Africanum*, angustis longioribus foliis, Jasmini floribus umbellatum," also cited, obviously foreshadows a later epithet of the specific name *Cotyledon jasmini-flora* by which the species was described by Salm Dyck (see p. 628).

It is not, of course, possible always to judge of the correctness of synonymy involving the pre-Linnaean phrase names, but there is ample reason to believe that the Dutch authors cited above, at least, were all dealing with the same species, living material of which had been collected at the Cape, most probably by Oldenland during one of his excursions to the eastern part of the Colony after plants, and sent by Governor Simon v. d. Stel to the Dutch gardens at Amsterdam and Leiden. From these historical gardens plants were also sent to many other gardens by way of exchange, both Plukenet and Tournefort, for example, receiving South African plants on a number of occasions of which there are actual records. It thus seems reasonably safe to assume that, in the particular case under review, all the authors cited had the same plant in mind. This being the case, then it follows that historically, *A. caryophyllaceus* (Burm. f.) is by far the oldest recorded species of the genus.

The Haworthian species of the genus (described by Haworth as species of *Cotyledon*, of course), were all described from specimens sent by James Bowie from the Cape to and cultivated at Kew between the years 1815-25, while Salm Dyck, who will be remembered for his monumental volumes on the "*Aloes*" and "*Mesems*," also had specimens from the Cape about the same time, principally from Ecklon, in addition to receiving some material from his correspondent Haworth, and cultivated these in his famous succulent garden on the Continent. Then there was a lapse in the introduction of new species of the genus until Thomas Cooper visited South Africa to collect plant material for William Saunders of Reigate in the early 60's. Three species of the genus were later figured for Saunders' "*Refugium Botanicum*"—*A. Cooperi* (Baker), *A. sphenophyllus*, *A. maculatus* (Salm Dyck)—from specimens sent to Reigate by Cooper, but it is only of comparatively recent date that such species as *A. cristatus* (Haw.) and *A. clavifolius* (Haw.), etc., are again coming into favour in Europe, a fine collection of species of the genus being in cultivation in the Royal Botanic Gardens, Kew (1930).

In general, unless exceptionally well dried, or accompanied by detailed notes on all parts of the fresh plant, accurate identification of the species from herbarium or other dried material is extremely difficult and in some cases well-nigh impossible. To obviate this difficulty in the future preservation of dried specimens should be duplicated by spirit material, as well as by accurate, wholly or partly coloured figures of the complete plant, together with notes made from the fresh plant of those features which are liable to disappear in the preservative fluid. The writer has found a system of "nature prints" made from the fresh leaves very useful in reconstructing their shape from the dried material. For this purpose cross-sections are cut at short intervals from one or more leaves with an old razor blade or sharp penknife, the exposed surface being inked over at every successive cut and carefully pressed on to a slip of paper in the exact order of the sections, this being supplemented by a "print" from a median longitudinal section of one or more leaves, care being naturally exercised not to exert undue pressure on the section in making each "print." The outlines are then very carefully inked over in india ink.

It is quite obvious, of course, that the system of "nature prints" could be used very effectively in succulent genera such as *Aloe*, *Haworthia*, *Crassula*, *Cotyledon*, *Euphorbia*, *Trichocaulon*, etc., and that where polymorphism in the leaves occurs, a representative series of "prints" could be made and attached to the sheet on which the dried specimen is afterwards mounted.

In maintaining *Adromischus* Lem. (emend.) as a genus distinct from *Cotyledon* Linn. (emend.), chief reliance is placed upon the characters presented by the inflorescence, in which the spicate to racemose arrangement of the 1-3-flowered cymules (as opposed to the panicked inflorescence of typical species of *Cotyledon*), is correlated with the shape of the corolla-tube, which is either somewhat ventricose above the base or narrowly cylindric, and the fusion of the segments so as to form a salver-shaped spreading or at length reflexing 5-toothed limb (rarely 5-lobed). Schonland (³), in his last paper on the genus *Cotyledon*, maintains Harvey's two original sections—PANICULATAE (= *Cotyledon* Linn., emend.) and SPICATAE (= *Adromischus* Lem., emend.)—but comes to the erroneous conclusion that the branching of the inflorescence of *Cotyledon caryophyllacea* Burm. f. (loc. cit. 151) bridges over the gap between the two sections. The arrangement of the flowers along the inflorescence-rhachis and its few racemose branches is, however, that of a typical raceme, and the structure of the corolla-tube and limb is that of other species of *Adromischus* Lem. (emend.), i.e. *Cotyledon* § *Spicatae* Harv. Branching of the inflorescence-rhachis also occurs, for example, in such species as *A. trigynus* (Burch.), *A. umbraticolus* C. A. Sm., *A. sphenophyllus*, *A. caryophyllaceus* (Burm. f.), etc., but in each case the flowers, apart from their structure, are always spicately or racemosely arranged and not panicked at the apex of the branches.

The known species of *Adromischus* Lem. appear to be readily capable of being grouped in two subdivisions, for which purpose (a), the inflorescence parts, and (b), the disposition of the leaves may be utilised :

(a) Owing to the inconstancy of the character presented by the type of inflorescence and the disposition of the flowers along the rhachis (1-2-3 at a node, though in some the 3-flowered condition remains constant), neither of the two characters could be employed satisfactorily for subdividing the genus. The nature of the limb of the corolla, however, is far more useful. Comparison, for example, of the corollas of such species as *A. kleinioides*, *A. rotundifolius* (Haw.), *A. maculatus* (Salm Dyck), *A. caryophyllaceus* (Burm. f.), and *A. mammillaris* (Linn. f.), with those of *A. rupicolus*, *A. nanus* (N. E. Br.), *A. umbraticolus* C. A. Sm., *A. procurvus* (N. E. Br.), show in the former group relatively long apical processes or teeth on the corolla-lobes, but these are absent or at most very much reduced in the latter group. This difference is also correlated with colour differences. Thus in the first group the corolla-tube is green and slightly ventricose above the base, and the limb white with (or without) rosy to pale scarlet flushes along the middle of each lobe, and usually scarlet to rosy-red below, or the limb entirely reddish to wine red or rusty red-brown. In the second group the corolla-tube is purple or purplish-mauve and cylindric, with a deep purple or purply-mauve throat, the limb being similarly coloured on both faces, though paler along the margins.

(b) A more obvious and conveniently described character for subdivision of the genus into two well marked groups is found in the disposition of the leaves on the stem, a consideration of which leads to the following :

I. Alternifolii *, Sect. nov.—Leaves alternate, usual closely crowded, though occasionally loosely scattered along the stem or its branches, rarely subrosulate.

e.g. *A. fusiformis* (Rolfe), *A. hemisphaericus* (Linn.), *A. mammillaris* (Linn. f.), *A. rotundifolius* (Haw.), *A. kleinioides*, *A. caryophyllaceus* (Burm. f.), etc.

II. Oppositifolii, Sect. nov.—Leaves opposite and decussate.

e.g. *A. maculatus* (Salm Dyck), *A. Cooperi* (Baker), *A. festivus*, *A. Bolusii* (Schonl.), *A. Marianae* (Marl.), etc.

For further subdivision each of the two sections may be divided on the shape presented by the leaves in cross-section, a character already employed by Berger (¹), who did not, however, employ sectional or subsectional names. Thus he separated those species with

* In some of the species belonging to this section, the leaves are apparently sub-opposite, but then the one leaf is always much shorter than the one sub-opposite to it.

flattened leaves as one group, and all the other species known to him fell into another group which he further subdivided according as to whether the leaves had a semiterete or terete cross-section. Utilising the characters here noted under each of the two sections above proposed, it follows that two subsections of each section are distinguished from one another on the same character, as will be seen from the following :

Sect. ALTERNIFOLII :

A. Platyphylli, Subsect. nov.—Leaves flattened (i.e. breadth in anterior half much exceeding the thickness, as seen in cross-section).

e.g. *A. rupicolus*, *A. rotundifolius* (Haw.), *A. humilis* (Marl.), *A. nanus* (N. E. Br.), *A. umbraticolus* C. A. Sm.

B. Heterophylli, Subsect. nov.—Leaves terete or more or less semicircular (i.e. breadth more or less equal to the thickness, as seen in cross-section).

e.g. *A. cristatus* (Haw.), *A. clavifolius* (Haw.), *A. mammillaris* (Linn. f.), *A. pachylophus*, *A. fusiformis* (Rolfe), *A. leucothrix*, *A. kleinoides*, *A. hemisphaericus* (Linn.), etc.

Sect. OPPOSITIFOLII :

A. Planifolii, Subsect. nov.—Leaves flat (i.e. breadth in anterior half much exceeding the thickness, as seen in cross-section).

e.g. *A. Bolusii* (Schonl.), *A. Alstoni* (Schonl. & Bak. f.), *A. sphenophyllus*, *A. maculatus* (Salm Dyck), *A. triflorus* (Linn. f.), etc.

B. Crassifolii, Subsect. nov.—Leaves terete or semiterete (i.e. breadth more or less equal to the thickness, as seen in cross-section).

e.g. *A. festivus*, *A. Marianae* (Marl.), *A. Cooperi* (Baker), etc.

Using the above as a basis, the species falling under each subdivision may very readily be distinguished from one another by utilising such characters as are afforded by indumentum, blotching of the leaves, flower colour, etc. This article is not offered as a revision of the whole genus, so that several species mentioned in the above general survey are not mentioned further on again, the following notes referring only to such species as (in the author's opinion) were wrongly interpreted, and such as may be regarded as hitherto undescribed, the tentative key being supplied for further discrimination between the species dealt with, and to indicate the rôle leaves and flowers play in the distinctions drawn.

In order to facilitate references to specimens dealt with, the herbarium in or from which a particular specimen has been examined is indicated by the following abbreviations, but those not seen, but cited, have the herbarium names only slightly abbreviated :

Pa, National Herbarium, Division of Plant Industry, Pretoria.

K, Herbarium of the Royal Botanic Gardens, Kew.

These abbreviations are inserted in brackets after each citation. This has the advantage of indicating to others where types are preserved, and tends to eliminate confusion in the interpretations of specific names assigned to the specimens examined.

KEY TO THE SPECIES.

Leaves opposite and decussate :

Leaves markedly flattened on both sides :

Corolla-tube green ; limb white or pale rosy :

Leaves blotched or spotted :

Leaves minutely dotted in the upper half.

Leaves with large blotches all over.

4. *A. rhombifolius*.

1. *A. maculatus*.

Leaves neither spotted nor blotched :

Leaves thickest in middle and upper half.

Leaves thickest in the lower half :

Flowers in 1-flowered cymules only.

Flowers typically in 3-flowered cymules :

Corolla-lobes ovate, obtuse, white above.

Corolla-lobes deltoid acuminate, rosy above.

3. *A. sphenophyllus*.

* *A. Bolusii*.

2. *A. triflorus*.

20. *A. alston*.

Corolla-tube never green, but usually dull purple-mauve ; limb pale purple-mauve or mauve.

26. *A. rupicolus*.

Leaves not flattened on both sides :

Leaves terete or subterete :

Apex of leaf expanded into a deltoid-ovate part broader than the leaf itself ; limb of corolla wine-red and papillose in the throat.

13. *A. Cooperi*.

Apex of leaf not as above ; limb of corolla white or rosy :

Leaves constricted at the base into a short petiolar portion, and flattened at the apex, ashy-grey between the large blotches.

15. *A. festivus*.

Leaves fusiform, the apex not flattened, green between the blotches.

12. *A. tricolor*.

Leaves oblong, flattened and subconcave above, convex below, thus semiterete in cross-section.

21. *A. Marianae*.

Leaves alternate and scattered or crowded :

Leaves markedly flattened on both sides :

Leaves closely spotted, especially in the upper half, and with firm white cartilagineous margins.

23. *A. nanus*.

Leaves not as above :

Corolla-tube green ; limb white to rosy or deep maroon above, scarlet or maroon below ;

Plants acaulescent, tuberous-rooted, with rosulate leaves..

22. *A. humilis*

Plants distinctly caulescent, fibrous-rooted, with the leaves crowded below the apices.

6. *A. rotundifolius*.

Corolla-tube never green, usually purplish-brown to -mauve ; limb mauve to purple on both sides :

Corolla-tube somewhat curved.

24. *A. procurvus*.

Corolla-tube straight :

Leaves subrosulate ; stems obsolescent.

28. *A. saxicolus*.

Leaves linear-oblong to elliptic-oblong sometimes crowded, but scattered ; stems welldeveloped :

Leaves " ovate-cuneate or suborbicular "

25. *A. trigynus*.

Leaves oblong to oblong-cuneate or obovate-cuneate.

27. *A. umbraticolus*.

Leaves not as above :

Leaves flattened or subconcave or subconvex above, but always markedly rounded below :

Leaves with a distinct indumentum :

Leaves elongate and deeply sulcate on the upper face, closely covered with rigid white bristly hairs.

Leaves not as in the former, " almost spherical," pubescent.

19. *A. leucothrix*.
A. Schaeferianus.

Leaves glabrous, at most with a waxy bloom :

Leaves semiglabrose, papillose, with acute margins, at most 1.5 cm. long.

5. *A. hemisphaericus*.

Leaves obovate or spatulate to oblong-elliptic, epapillose and glossy green, with rounded margins, up to 3 cm. long.

7. *A. caryophyllaceus*.

* The specific names not numbered are not referred to in the text.

Leaves more or less terete :

Leaves abruptly narrowed into a much thinner "petiolar" part in the lower third :

Stems densely covered with rusty- to red-brown aerial roots :

Leaves flabelliform with a flattened crisped apex, and nearly as broad as long in the thick part.

17. *A. cristatus*.

Leaves elongate and subcylindric, slightly crisped at the narrow flattened apex, the thicker part very much longer than broad.

18. *A. clavifolius*.

Stems at most with nodal tufts of adventitious roots :

Leaves glabrous, expanding into a broad ovate apical part much wider than the leaves.

14. *A. pachylophus*.

Leaves pubescent, at most with a flattened but not expanded apex.

16. *A. Zeyheri*.

Leaves without a definite "petiolar" part, at most only insensibly tapering at the base :

Leaves 1-2, "almost spherical".

A. sphaerophyllus.

Leaves numerous :

Stems prostrate and rooting at the nodes, the vegetative parts very like those of *Kleinia radicans*.

11. *A. mammillaris*.

Stems (where developed) erect :

Stems simple or many, tall and over 10 cm. high :

"Semi-shrub, with many stems; flowers greenish-red."

[hardtii.
A. montium-king-

Plants not as above; stems simple and elongated :

Corolla limb pallid; leaves flecked with purple.

A. fusiformis.

Corolla limb deep maroon to red-brown on both sides; leaves unspotted.

10. *A. kleiniioides*.

Stems very dwarf (or almost to absent) :

Leaves oblong, narrowed to the base.

9. *A. Marlothii*.

Leaves fusiform ("tereti-acuminata"), tapering at both ends.

8. *A. flicaulis*.

Leaves "pea-shaped," with red dots.

A. Keiackii.

1. *A. maculatus* (*Salm Dyck*) *Lem. ex Berger*.

Of this species there is a very fine coloured figure of a complete plant in the collection of drawings at Kew, dated "February 15, 1824," when it was made from "a typical plant received from Salm Dyck. Compared with an authentic specimen in Haworth's Herbarium at Oxford. Oct. 31, 1901. N. E. Br." In the above collection there is also a very careful drawing of Haworth's specimen, showing a complete inflorescence and two leaves, and against the former Haworth noted "Kew Sept. 28, 1824," while against the two leaves he noted "Hot ironed. Ex. horto, Apr. 1827." The inflorescence of Haworth's specimen thus in all probability came from the specimen "received from Salm Dyck," and from the extremely close match of the illustrations, there can be little doubt that they all represent the same species, viz. *Cotyledon* * *maculata* Salm Dyck [Obs. Bot. in Cat. Hort. Dyck. 5 (1820), ex Haw., Rev. Pl. Succ. 21 (1821)]. Now the figure of *C. maculata* in Saund., Ref. Bot. I. t. 35 (1869), agrees exactly with the figures already cited, except that the flowers are always in pairs (one of which is generally a bud) in the lower part of the inflorescence, but are singly disposed at the nodes in the apical part, whereas Haworth's specimen and the figures just cited all show the sessile flowers to be singly disposed along the rhachis, i.e. in the form of a simple spike. Specimens, again, collected by the writer at Robertson in April, 1926, flowering at the Division of Plant Industry in December of the same year, and undoubtedly referable to this species from their close match with the Kew plate, also showed single flowers at the nodes of the inflorescence rhachis, as will be seen in the accompanying Figure 1.

* For convenience, the species in these notes are cited in the text hereafter by their old name under *Cotyledon* (*C.*).



FIG. 1.—*A. maculatus* (Salm Dyck) Lem. ex Berger. See text.

Thus it would appear that the plant may show a variation of from 1-2 (apparently never more) flowers at the nodes, with the 1-flowered nodal condition as the more typical. Such variation in what must be regarded as an originally 3-florous cymule is by no means uncommon in the genus, occurring, for example, in *A. sphenophyllus*, the next species but one. However, in selecting the type of the name *C. maculata* Salm Dyck, the choice lies between the coloured plate made at Kew and Haworth's specimens, since Salm Dyck does not appear to have kept a specimen of the plant originally described by him. Haworth's specimens are made up of parts introduced, as noted above, at different dates, and the leaves "ex horto" were (in view of the different labelling) certainly not obtained from the same plant as the inflorescence. The coloured plate in the Kew collection should therefore be selected as representing the typical plant, the more so since it was made from specimens named and sent as *C. maculata* by Salm Dyck himself.

With reference to the "Refugium Botanicum" plate (t. 35), identified with this species above, Schonland and Baker fil. (4): state that it "may represent a spotted variety of *C. rhombifolia* Haw.", as typified (on their authority) by t. 36 of the same work. The latter, however, cannot be regarded as that species (see No. 3). Then, again, in his last paper on the genus *Cotyledon* Linn. (sensu Fl. Cap.), Schonland (3), regards "*C. maculata* Salm Dyck" as a doubtful synonym of "*C. rhombifolia* Haw.", stating: "It is . . . a little doubtful whether the plant he [Baker] figured [Ref. Bot. t. 35] as *C. maculata* Salm Dyck is really that species," but does not advance any reasons for this statement, though he further suggests (3) that "the true *C. maculata* Salm Dyck may be identical [sic!] with *C. trigyna* Burch." In both statements Schonland erred through erroneously identifying specimens of *C. nana* N. E. Br. as *C. maculata* Salm Dyck, from which it differs conspicuously in the structure of its flowers, though agreeing with *C. trigyna* Burch. in habit and floral characters.

For convenience Salm Dyck's original diagnosis may be here inserted:

"*C. suffrutescens*, foliis ovato-spathulatis basi subauriculatis, carnosius, nitidis, utrinque maculis atro-rubentibus notatis. Floribus spicatis, subalternis." Schonland and Baker fil. (*loc. supra cit.*) giving the following notes made from Haworth's specimens: "Leaves few, obovate or obcordate emarginate, apex obtuse with a short acumen, margin cartilagineous sometimes undulate, base cuneate, 4.2-4.5 cm. long, 2.3-3.3 cm. broad at the broadest point which is about one fourth of the total length from the apex. Flowers sessile, solitary, numerous, erecto-patent, alternate, arranged in a lax spike. Peduncle terminal, terete, of a purplish colour. Calyx-lobes short (about 1 mm. long). Corolla tubular, somewhat ventricose above the calyx, \pm 8 mm. long; lobes erect or erecto-patent, \pm 3 mm. long, acute." With this description to go by, especially that part relating to the flowers, it is difficult to understand how the above errors cropped up in Dr. Schonland's paper.

The following represents the revised synonymy for the species:

A. maculatus (Salm Dyck) Lem. in Jard. Fleur. II. Misc. 60 (1852), ex Berger in Engl. and Prantl, Nat. Pflanzenfam, Vol. 18, a. 416 (1930).

Cotyledon maculatus Salm Dyck, Obs. Bot. 5 (1820), ex Haw., Rev. Pl. Succ. 1821; Eckl. & Zeyh., Enum. No. 1973 (1836); Harv. in Harv. & Sond., Fl. Cap. II. 378 (1861-62); Baker in Saund., Ref. Bot. I. t. 35 (1869); Schonl. & Bak. f. in Journ. Bot. Vol. 40. 92 (1902).

C. alternans Salm Dyck ex Haw., Suppl. Pl. Succ. 26 (1819); non Willd. (1799).

A. mucronatus Lem. in Jard. Fleur. II. Misc. 60 (1852), ex Ind. Kew. & Berger (*loc. cit.*).

C. hemisphaerica Harv. in Harv. & Sond., Fl. Cap. II. 376 (1861-62), partim; non Linn. (1762).

SOUTH WESTERN REGION—Worcester distr. : “ In aridis in convalle flum. Hex River, prope De Doorns, 1600 ped., Jan. 1908,” *Bolus* 13044! (K.). Robertson distr. : Near Robertson Station, on the western slope of a rocky hill, associated with *Gasteria carinata* Haw. in shady places, April 1926, flowering at Division Plant Industry, Dec. 1926, *Smith in Nat. Herb.* 8875! (Pa.).

CENTRAL REGION—Oudtshoorn distr. : In a poort on shale of the Bokkeveld series, between Oudtshoorn and Montagu Pass, April 1930, *van Nieuhuys!* s.n. (Pa.).

2. *A. triflorus* (Linn. f.) Berger.

The type specimen of this species was collected by Thunberg “ prope Zekorivier ” [Zeekoerivier] in the Clanwilliam district, during Dec.–Jan. 1774–75, and a much more detailed and amplified description given by him (Fl. Cap. Ed. Schult. 396 : 1823) than was first supplied by the younger Linnaeus (1781), and is here quoted for purposes of reference : “ Caulis carnosus, crassus, herbaceus, glaber. Folia : inferne sessilia, crassa, obtusissima, subtruncata, inferne attenuata, basi teretiuscula, approximata, erecta, subincurva, glabra, bipollicaria, ultra pollicem lata, pallida viridia. Omnino referunt folia Cotyledonis orbiculatae. Flores subterni, spica longa, spithamea, rachis angulata. Bractea sub singulo flore minuta. Perianthium monophyllum, 5-dentatum, erectum, viride, brevissimum. Corolla 1-petala, tubulosa ; tubus cylindricus, striatus, viridi-rufescens, subunguicularis, glaber : Limbus 5-partitus patens : Lacinae ovatae, obtusae, intus albae, extus rufescentes, lineam longae. Filamentae 10, tubo inserta, paulum adnata, subulata erecta, viridia, tubo breviora. Antherae ovatae, minutae, flavae. Nectarii squamae 5, ad fundum germinis, subexcisae, albae. Germina supra 5, subulata, glabra, viridia. Stigmata acuta. Capsula 5, subulata.”

So far as is known, the species appears not to have been found since Thunberg's time, though a specimen described by Lemaire in 1852 (*loc. infra cit.*) as *Adromischus robustus* Lem., is regarded by Berger (*loc. infra cit.*) as conspecific with Thunberg's plant, though it is not known from what locality Lemaire had his plant(s). Both Salm Dyck (Obs. Bot. 6 : 1820) and Haworth (Rev. Pl. Succ. 19 : 1821) described what they took to be *C. triflora* Linn. f., but were guided probably more by the 3-florous condition of the cymules in the inflorescence of their plants, which these exhibited in common with Thunberg's specimen, and their erroneous identifications were perhaps natural in view of the inadequate diagnosis of *C. triflora* given by both the younger Linnaeus (*loc. infra cit.*) and Thunberg (Prodr. Pl. Cap. 83 : 1794), which they must have consulted, since the latter's “ Fl. Cap. Ed. Schultes ” did not appear till 1823 (see also note under the next species, No. 3).

Then Harvey (2), for no clear reason, reduced *C. triflora* Linn. f., the type specimen of which he had seen, under *C. hemisphaerica* Linn., though he cites the typical plant of the latter as figured in Dill. Hort. Eltham. t. 95, f. 111 and DC. Hist. Pl. Grass. t. 87! The leaves of the former species, however, differ so profoundly in shape size and cross-section from those of the latter, that Harvey's reduction is wholly unwarrantable (see also note under No. 5).

A. triflorus (Linn. f.) comes closest to *A. sphenophyllus* (the next species), but differs from this in several characters, such as size and leaf-shape, colour of flowers and shape of its corolla-lobes, smaller and less excised nectarial scales, which taken in conjunction with its “ western ” distribution, as opposed to the “ south-western ” distribution of the other, have led the writer to keep the two species apart. The following embraces the synonymy treated above :

A. triflorus (Linn. f.) Berger l.c. (416).

Cotyledon triflora Linn. f., Suppl. 242 (1781) : Murr., Syst. Ed. xiv. 429 (1784) ; Thunb., Prodr. 83 (1794) ; & Fl. Cap. Ed. Schultes, 396 (1823) ; *non auct. alior.*

C. hemisphaerica Harv. l.c. 376, partim ; *non* Linn. (1762).

A. robustus Lem. in Jard. Fleur. II. Misc. 60 (1852), ex Berger l.c.

WESTERN REGION—Clanwilliam Div.: Near the Zeekoerivier, Dec.–Jan., 1774–75, Thunberg. (Type in Herb. Thunb., Upsala).

3. *A. sphenophyllus* C. A. Sm., nom. nov.

A dried specimen of the type gathering of the species, figured as *C. rhombifolia* Haw. in Saund., Ref. Bot. I. t. 36 (1869), is in Herb. Kew., having been presented by W. W. Saunders in 1877. In this the inflorescence is simple and the flowers singly disposed at the nodes. Cooper's original specimen, i.e. the wild plant (Cooper 2338! C. B. S., *sine loc. exact.*) is also in Herb. Kew., and the inflorescences mounted on the sheet show one with 1-, and the other with 1–3-flowered cymules. Neither, however, represents the typical form of Haworth's species (*v. seg.*), but they both match a fine coloured illustration (in the collection of drawings at Kew) of a plant which is, however, without inflorescence "received [as *C. triflora*] from the Prince of Salm in the year 1823," and against which N. E. Brown has noted: "This quite agrees with the leafy part of the specimen of *C. triflora* in Haworth's Herb. at Oxford. Compared Oct. 30, 1901." There can be no doubt that the specimen in Haworth's herbarium was sent him by Salm Dyck at the same time that the latter sent the specimen to Kew, and that they came from the same original gathering. This is further borne out by the fact that both Salm Dyck and Haworth describe "*C. triflora* Linn. f.", and their descriptions agree very closely, while there can be no doubt that also in inflorescence details the latter species [i.e. *C. triflora* Salm Dyck (non Linn. f.)] agrees with those in *C. rhombifolia* Baker (non Haw.), though the inflorescence of the former in Haworth's herbarium shows signs of having been injured by mechanical or biotic agencies. From the descriptions and specimens available, however, it would appear that the cymules may be 1–3-flowered in this species.

Since neither of the two specific names may validly be applied to the species under consideration, the following new name (with details of synonymy) is proposed for it under *Adromischus*:

A. sphenophyllus C. A. Sm., nom. nov.

Cotyledon triflora Salm Dyck, Obs. Bot. 6 (1820); Haw., Rev. Pl. Succ. 19 (1821); Schonl. & Baker f. l.c. (91), non Linn. f. (1781).

C. rhombifolia Baker in Saund., Ref. Bot. I. t. 36 (1869); Schonl. & Baker f. l.c. (92); Schonl. in Rec. Alb. Mus. Vol. 3, 154 (1915), excl. syn.; non Haw. (1825).

A. rhombifolius Berger l.c. (416); non *C. rhombifolia* Haw. (1825).

"C. B. S." (*sine loc. exact.*): *Cult. spec. e Hort. Saund. leg. Cooper!* Type (K); Cooper 2338! Syn-type (K).

CENTRAL REGION—Willowmore distr.: On hillside near Willowmore, anno 1931, Steyn! s.n. (Pa).

N.B.—The specimen referred to under "*C. rhombifolia* Haw." by Schonl. & Baker f. (*loc. supra cit.*) as having "flowered at Grahamstown in the Spring of 1898" no doubt belongs here.

4. *A. rhombifolius* (Haw.) Lem. ex Berger.

This species was originally described by Haworth (*loc. infra cit.*) from a non-flowering specimen which was apparently never kept, since there is no plant so named in Haworth's herbarium at Oxford. From his description, however, there can be little doubt that the

specimen figured and described by Baker under the name *C. rhombifolia* in Saund., Ref. Bot. I. t. 36, is distinct in habit and shape of its leaves from Haworth's plant. Fresh specimens from between Oudtshoorn and Montagu Pass, and recently examined by the writer, agree perfectly with Haworth's description, so far as this goes, and serve still further to distinguish Baker's plant from the species under discussion. Unfortunately it has not been possible to give an amended description of the species from the fresh material available, but this defect may be rectified at a later date.

A. rhombifolius (Haw.) Lem. in Jard. Fleur. II, Misc. 60 (1852), ex Berger, l.c. 416, *quoad nom. sol.*

Cotyledon rhombifolia Haw. in Phil. Mag. 1825, 33; DC., Prod. Vol. 3, 398 (1828); Harv. l.c. 378; Schönl. l.c. 154, partim, et excl. syn.

CENTRAL REGION—Oudtshoorn distr.: Between Oudtshoorn and Montagu Pass, 7 miles from North Station, in Bokkeveld series on outcrops of Table Mountain Sandstone, April 1930, *van Nouhuys*! s.n. (Pa).

Originally described from specimens sent from the Cape to Kew by James Bowie in 1823, but there is no record so far known of where he collected his specimens, nor has a single specimen been kept.

5. A. hemisphaericus (Linn.) Lem. ex Berger.

This species has apparently never been correctly interpreted by monographers of the South African species of *Cotyledon* Linn. (sensu Fl. Cap.), except perhaps by Berger. It was originally based by Linnaeus on a Dillenian figure—Hort. Eltham. t. 95, f. 111 (1738), where it is named as "*Cotyledon Capensis, folio semiglobato*." According to Druce and Vines (Dillen. Herb. 165: 1907), there is no specimen of the species in the Dillenian Herbarium at Oxford, nor is there such a specimen either in Herb. Cliff. or Herb. Linn. in London, but Dillenius' figure (which thus represents the type figure) is accompanied by such an excellently drawn up description of the plant that, in view of the statement in the first sentence above, this description is here given in full, the more so since the original work may not readily be accessible to others: "Cauliculi carnosissimi lenti sunt, non recta protensi, sed incurvi & pleurumque tortuosi, laeves, spadicei, variis lineis cinereis, nunc rectis, nunc transversis, nunc inaequali ordine connexis distincti, quibus hinc inde folia singularia, in summitato vero plura temere apposita sunt, levi tactu deciduntia colorem, tenuibus punctis undique notata, crassa; inferius, seu ad basim cauliculorum, rotundiora, superius seu versus summitatem magis plana, lenius nempe parte interiori elevata, exteriori vero, ut in illis, protuberante & pulvinata, succulenta, sapore acerbo & adstringente praedita.

"A palmari ad dodrantalem & pedalem subinde nascitur altitudinem, & caules carnosolignosos, magis ramosos, acquirit, sed longo temporis spatio indiget, ut adhuc altitudinem perveniat; lente enim nascitur, & facile ob succositatem putrescit.

"Porro flores aegre fert, nec eos una vice amplius vidisse memini, eosque imperfectos: scapus erat dodrantalis subteres, glaber, obsolete virescens, secundum cujus longitudinem gemmae quaedam tenues, in summitate vero flores oblonges sex septemve nascebantur, quinque lineis impressis notati, virescentes, in extremitate purpurascens, calyce monophyllo, in quinque laciniae diviso excepti, & hujus ope scapo annexi, tenui ligula ab basim praedita, qui quales suturi essent, dicere non habeo, cum apertos videre non contingerit. . . . Haec Augusto mense observare licuit."

Two other published figures of the above species, both in colour and both correctly identified specifically, are known to the writer: Roth, Bot. Abhandl. & Beob. t. 6 (1787) and DC., Hist. Pl. Grass. t. 87 (1799–1829).

Roth's figure is excellent for the habit and leaves of the plant and typical of the species as represented by the type figure. He figures the flowers, however, as being borne in sessile pairs among the apical leaves on the short and podgy lateral upper branches of the stem, and does not give a detailed description of the plant in the text, but in the index to the plates in the work he describes the flowers as "in capituli speciem collecti, quorum bini hic [i.e. in the plate] conspiciuntur," and "initia forte spicatum, quae tamen absque mutatione molis perierunt." The young inflorescence is frequently (especially in cultivated specimens) injured by aphids, and so gives rise to various teratological forms, such as suppression of the main axis of the inflorescence, oppositely borne 1-6-flowered cymules, etc. Hence the condition figured by Roth.

De Candolle's exquisite plate again is perfect for the species, though not illustrating the characteristic habit so well as Dillenius' or Roth's figure does, but showing the shape, colouration and papillose texture of the leaves exceptionally well, these being further described as "sparsa, sessilia, ovato-rotunda, subtus valde convexa et inde semiglobata, subobtusata, pingua, glabra, furfure punctata."

In the Kew collection there is a fine coloured illustration of the type plant of *C. cuneiformis* Haw. (Phil. Mag. 1828, 185), which is noted as "Received from the Cape of Good Hope in 1823 from Mr. Bowie." Though not in flower at the time of figuring, the plant agrees in all essential vegetative characters with the three plates of *C. hemisphaerica* Linn., and there can be very little doubt that Haworth's plant is conspecific with the latter.

None of these plates presents any difficulty since they clearly represent one and the same plant, yet so consistently has the species under review been misinterpreted by various authors that one can only conclude that (excluding for the moment Haworth's and Roth's figures as being less readily accessible) the Dillenian and De Candollean plates were never properly referred to. Thus Schonland⁽³⁾ reduces "*C. triflora* Linn. f." and "*C. rotundifolia* Haw.," both of which he had wrongly interpreted, under "*C. hemisphaerica* Linn.," also stating (*loc. cit.* 153) that *C. nana* N. E. Br. "evidently [*sic!*] belongs to this species though it has only a one-flowered peduncle," and this in spite of the very different and distinctive type of flowers produced by the latter and the conspicuous blotching of its leaves. Of Haworth's *C. rotundifolia* there is an exact drawing in the Kew collection of drawings (a photo of the type specimen is given in Journ. Bot. Vol. 40, t. 435), and comparison of this taken in conjunction with the existing descriptions of the species, indicates clearly the very distinct specific differences between *C. rotundifolia* Haw. and *C. hemisphaerica* Linn. The differences in foliage characters may best be illustrated by cross-sections as shown in the following figure:

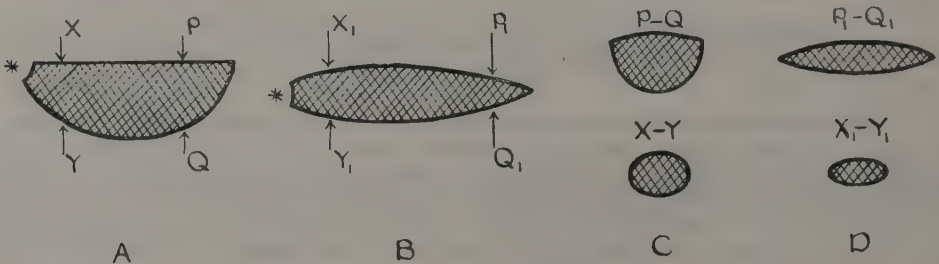


FIG. 2.—A. Median longitudinal section through the fresh leaf of *A. hemisphaericus* (Linn.), with transverse sections in the regions X—Y and P—Q indicated by C; B. Median longitudinal section through the fresh leaf of *A. rotundifolius* (Haw.), with transverse sections in the regions X₁—Y₁ and P₁—Q₁ indicated by D. The base is marked by an asterisk.

[*C. triflora* Linn. f. similarly differs from *C. hemisphaerica* Linn. in having leaves which are flat, i.e. their thickness in the anterior half (as seen in cross-section) much exceeds the breadth, apart even from the fact that they are opposite in that species and its flowers are arranged in 3-flowered cymes along the inflorescence rhachis.]

Harvey ⁽¹⁾ also reduces *C. triflora* Linn. f. (of which he had actually seen the type, and which he cites as of "Thunb. Fl. Cap. p. 396") under *C. hemisphaerica* Linn., and in this he may have been followed by Schonland, but from the previous paragraph it is evident that this reduction is quite untenable. From the fact that Harvey describes the leaves as "flat, 1-2 inches long, 1-1½ inches wide," as well as other details, it would appear that he based his description of "*C. hemisphaerica* Linn." for the greater part on the type specimen (Thunberg's) of *C. triflora* Linn. f. and Ecklon & Zeyher's specimens of *C. maculata* and *C. rhombifolia*. Baker had also, as far back as 1869, pointed out that Harvey's synonymy for *C. hemisphaerica* Linn. was erroneous, correctly laying stress on the shape, relative size and colouration of the leaves of the latter species, of which he had himself seen live cultivated specimens as well as de Candolle's fine plate above noted, though Baker, like Harvey, omitted to note the all important fact that in *C. hemisphaerica* Linn. the leaves are alternate, and opposite in the other three species regarded as conspecific with it.

The writer has also examined the type plant of *C. nana* N. E. Br. (see No. 12) at Kew and cannot endorse Dr. Schonland's statement previously quoted. In habit and foliage it approaches *C. maculata* Salm Dyck, but its leaves are alternate, while its floral characters, as noted above, readily remove it from the group to which *C. hemisphaerica* Linn. belongs.

The revised synonymy for the latter species would then be as follows :

A. hemisphaericus (Linn.) Lem. in Jard. Fleur. II, Misc. 60 (1852), *ex Berger*, l.c. (416).

Cotyledon hemisphaerica Linn., Sp. Pl. Ed. ii. I. 614 (1762); Roth, Bot. Abhandl. & Beob. t. 6 (1787); Willd., Sp. Pl. II. 756 (1799); DC., Hist. Pl. Grass. t. 87 (1799-1832); Dryand. in Ait., Hort. Kew. Ed. ii. III. 109 (1812); Haw., Syn. Pl. Succ. Ed. Germ. 116 (1819); Harv. l.c. (376), *pro minime parte, excl. syn. Thunb., E. & Z., et spec. Zeyh. et Drège*; Baker in Saund., Ref. Bot. I. sub. t. 36 (1869), in obs.; Schonl. l.c. 152, *pro minime parte, et excl. syn. Linn. f. et Haw.*

C. cuneiformis Haw., in Phil. Mag. 1828, 185.

Cotyledon capensis foliis semiglobosis Dill., Hort. Eltham. t. 95, f. 111 (1738).

The writer has so far not seen a single dried or living specimen of this interesting species, which is historically the eldest in the genus, and no one appears to have re-discovered the plant during the last 70 odd years.

E. & Z. (Enum. 307 : 1836) quote their No. 1970 as "*C. hemisphaerica* Linn.", and as being collected "inter saxa . . . laterum montis 'Leeuwenberg' (Cap.)," but the writer has not seen these specimens, and believes these to belong to *A. rotundifolius* (Haw.), the next species, of which specimens have been collected in the same locality (=Lions Head).

6. A. rotundifolius (Haw.) C. A. Sm., comb. nov.

There is an accurate drawing of Haworth's type in the collection of drawings at Kew, a fair photographic reproduction of the type being also given by Schonl. & Bak. f. ⁽⁴⁾. These authors state (*loc. cit.* 91) that this species is "probably not specifically distinct from *C. hemisphaerica* Linn.," but that "the leaves are broader, branches less erect, and the caudex thicker" than in the latter. The last two characters are of doubtful value, since the branches in typical specimens of *C. hemisphaerica* Linn. are frequently spreading and the caudex up to 3 cm. in diam. The leaves, however, afford the best and most ready characters for distinguishing between these two species (see Fig. 2, and note under previous species), those of the latter being semiglobose and not obovate to rotund and flat.

The following notes made from Haworth's type by the above two authors will serve to supplement Haworth's description: "Leaves subrotund, apex rounded, margin sometimes somewhat undulate, 2.5-3.5 cm. long, 2-2.5 cm. broad, glabrous. Flowers sessile, solitary or rarely in twos, patent or erecto-patent, spicato-racemose. Calyx-lobes deltoid, short, about 1 mm. long. Corolla tubular, tube \pm 1.1 cm. long, lobes ovate, subacuminate, finally reflexed or subreflexed." In addition may be given the following details drawn up from fresh specimens cited below and collected by the writer: "Succulent perennials growing socially in close masses between rocks and in fissures of rocks and other crevices, usually in shady situations. Stems several from the crown of the rather shallow growing fibrous root system, or single, usually very short and stout, with or without short stubby branches which bear the leaves, rigid, terete, with numerous more or less concave protuberances marking the old leaf bases and thus giving the stems an irregular outline, leafy only in the upper third, and covered with a thin chartaceous greyish skin, glabrous. Leaves alternate, scattered, very fleshy, suborbicular to obovate or obovate-cuneate, always rounded at the flat or slightly crinkled apices, thickest at the flattened expanded base, becoming thinner towards the apex, greyish-green in colour and unspotted."

A. rotundifolius (Haw.) C. A. Sm., comb. nov.

Cotyledon rotundifolia Haw., in Phil. Mag. 1827, 273; Schonl. & Bak. f. l.c. 91; R. A. Dyer in Bot. Mag. t. 9368 (1934).

C. hemisphaerica Harv. l.c. 376, *partim*; Schonl. l.c. 152, *partim*; non Linn (1762).

C. Bolusii Schonl. l.c. 59.

A. Bolusii (Schonl.) Berger l.c. 416.

A. hemisphericus, Jacobsen, Succ. Pl. (Engl. trans.), 17 (1935); non Lem.

SOUTH WESTERN REGION—Cape distr.: Rocky crevices on west side of Lion's Head, above Capetown, *Wolley Dod* 2279! (K). Stellenbosch distr.: In fissures of rocks and in crevices between rocks on the western slopes of the Hottentots Holland Mountains at Sir Lowry's Pass, near the tunnel, March 1931, *Smith* 6000! (Pa) *et spec. cult.* (Pa).

Here may probably also be referred *Cooper* 3628! (C. B. S., *sine loc. exact.*), preserved in Herb. Kew.

This is the only species of the genus so far known, to reach the Cape South-West (see also last paragraph under the preceding species).

7 **A. caryophyllaceus** (Burm. f.) Lem.

This is one of the earliest known species of the genus, being fairly well figured and described by the elder Burmann in his Rar. Pl. Afr. p. 39, t. 17, published in 1738, a year after Dillenius published his figure of *C. hemisphaerica*, and specifically named by the younger Burmann in 1768 (see also p. 615). It still remains, like the latter, one of the rarest of South African plants, having apparently been collected only twice since 1738. In 1818 Salm Dyck had it from the Cape and described it as *Cotyledon jasminiflora* Salm Dyck (Obs. 30: 1820), under which name Haworth also received it about the same time from Salm Dyck, neither recognising the much earlier name for the species in Burmann's *C. caryophyllacea*. And it was not until c. 1878 that Bolus rediscovered the plant "in fissuris rupium in monte Tandjiesberg, prope Graaff-Reinet," and for the first time definitely identified the wild plant with that figured by Burmann nearly a century and a half earlier. Schonland and Baker fil. were the first to point out, however, as a result of examining Haworth's specimens of *C. jasminiflora* Salm Dyck in his herbarium at Oxford (1902), that the latter plant was conspecific with *C. caryophyllacea* Burm. f., both these specific names being referred to by Harv.(2) under the heading of "Imperfectly known and doubtful species" of *Cotyledon*.

In as much as no complete description has as yet been drawn up from living specimens of the species, Burmann's original account is here given in full for purposes of ready reference and convenience: "*Cotyledon foliis ad genicula plurimis planis, oblongis; floribus gemellis, erectis, Caryophyllaeis*. Ex plurimis fibrillis tenuibus, flexuosis, intricatis, nigricantibus, ex uno centro prorumpentibus oritur caulis unus alterve, qui in ejus summo folia gerit plurima collecta, & ex uno quasi centro provenientia, quae sunt plana, obliqua, ex tenuiori basi in latum apicem desinentia, crassa, venosa, glauca, limbo purpureo; ex horum centro erigitur caulis florifer tenuis, rotundus, viridis, qui ultra dimidium divaricatur, & in ejus summo gerunt flores utcumque gemellos, singuli tamen suo petiolo proveniunt; suisque calicibus tenuibus, oblongis, quinquefidis continentur; flores hi sunt tenues, oblongi, tubulosi, forma fructus Caryophylli arboris referentes, in summo quinquefidi, segmentis planis, angustis, acutis carneis, in singulo segmento linea rubra distinctis, seu variegatis. Post hos sequuntur fructus teretes, in quinque loculamenta perpendiculariter sissi, quinqueloculares, in singulo loculo continentis semina minima subrotunda, fusca". In addition to the above the following notes, made by Schonland and Baker fil.⁽⁴⁾ from authentic specimens in Haworth's herbarium, will serve to amplify Burmann's description: "Stem rather thick, branching, 6.0 cm. long, suffrutescent. Leaves fleshy, oblanceolate or oblong-spathulate (convex above, rounded below, thickish), green, shining, 1.3-3.0 cm. long, and .9-1.3 cm. broad at the broadest part, obtuse. Scape 13-15 cm. long, 4-6-flowered, sometimes the scape branches, and branches reach 5.5 cm. long, ascending. Pedicels sometimes rather short, thickened obclavate, 3-5 mm. Flowers erect, with a green tube and a revolute purple and white limb. Calyx lobes triangular, acute, 1.5 mm. long. Corolla tube 1.4 cm. long, lobes ovate acute, nearly 5 mm. long. Stamens included. Squamae longer than broad".

The joint authors of these notes (*cit. i f.*) regard this plant to be allied to *C. hemisphaerica* Linn. "in the structure of its flowers", but the flower is almost exactly that of *C. rotundifolia* Haw. (the previous species), *C. maculata* Salm Dyck, etc., which all certainly have the same fundamental floral structure as that of *C. hemisphaerica* Linn., but the flowers are much larger in size and of quite different colouration than those of this species. On the whole this is one of the most well marked species in the genus, with a possible affinity, as far as habit and floral characters are concerned, with *C. rotundifolia* Haw. The following synonymy must supplant that so far given by authors:

A. caryophyllaceus (Burm. f.) Lem. in Jard. Fleur. II., Misc. 60 (1852) ex Berg. l.c. 416.

Cotyledon caryophyllacea Burm. fil., Prod. Fl. Cap. 13 (1768); DC., Prod. III. 398 (1828); Harv. l.c. 378, Schonl. & Baker f. l.c. 93; Schon. l.c. 151.

C. jasminiflora Salm Dyck, Obs. 38 (1820); Haw., Rev. Pl. Succ. 20 (1821); DC., Prod. III. 398 (1828); Harv. l.c. 378.

A. jasminiflorus (Salm Dyck) Lem. in Jard. Fleur. II. Misc. 60 (1852), ex Berger l.c. 416.

C. foliis ad genicula plurima planis, oblongis; floribus gemellis, erectis, caryophyllaeis, Burm., Rar. Afr. Pl. 39, t. 17 (1738).

"C. B. S." (*sine loc. exact.*): *Cult. spec. e Hort. Dyck.*! Type, in Herb. Haw. Oxon.

CENTRAL REGION—Graaff-Reinet distr.: In rocky fissures on the slopes of the Tandjiesberg, near Graaff-Reinet, anno 1878, *Bolus* 758! (K).

Bolus states that the plant is extremely rare.

Cotyledon mammillaris Auct. non Linn. f.

Schonland⁽³⁾ considers the plant figured in Bot. Mag. t. 6020 as representing the typical *C. mammillaris* Linn. f., but, in as much as Thunberg (Fl. Cap. Ed. Schult. 397) describes the stem as "repens, radicans, . . . crassitie dimidia calmi . . ." and the leaves as "secunda, verticellata, instar mammillae . . . unguicularia . . .", the corolla-tube as "viridis . . . unguicularis" and the limb as "plicatus . . . albedo-purpureus . . .", there can be no doubt that the Botanical Magazine plant (description below) is quite distinct from the species described by Linneaus fil. and is thus without a valid name, unless either of the two synonyms cited by Schonland (*loc. supra cit.*), viz. *C. filicaulis* E. & Z. and *C. Marlothii* Schonl., may be resuscitated for the Botanical Magazine plant, this depending on whether these plants are conspecific with the latter.

A comparison of Harvey's⁽²⁾ description of *C. mammillaris* Linn. f. with that of the type of this name as given by Thunberg (*loc. supra cit.*) immediately shows that Harvey must have described almost exclusively from *E. & Z.* 1975, the type of *C. filicaulis* E. & Z., cited by Harvey as a synonym of the former, and Zeyher 2897. Thus Harvey gives "stems very short or scarcely any; leaves crowded round the apex, or scattered along the short stem . . . 1½–2 inches long", and these details certainly exclude the specimens cited from *C. mamillaris* Linn. f. Moreover, the two species come from very different botanical areas—the former from the Khamiesberge in Little Namaqualand, and the latter from the Oudtshoorn div. in the southern limits of the Central Region, and from the latter, as well as from the Robertson district the writer has seen a number of fresh specimens which agree perfectly in every detail with Thunberg's description of his type specimen of *C. mammillaris* Linn. f. but certainly not with the Ecklon and Zeyher type material. The latter also differs very markedly from the Botanical Magazine plant in its very much dwarfer habit, much shorter racemose inflorescence in which the flowers are borne in 1-flowered cymules at the nodes, and in the colour of its flowers. Hence *C. filicaulis* E. & Z. ranks as a species by itself which, under *Adromischus* Lem. will bear the following name (with details of synonymy):

8. A. filicaulis (E. & Z.) *C. A. Sm.*, comb. nov.

Cotyledon filicaulis E. & Z., Enum. 307 (1836).

C. mammillaris Harv. l.c. 377, *pro majore parte, sed excl. syn. Thunb., et DC., non Linn. f.*

WESTERN REGION—Namaqualand Minor: Sides of the Khamiesberge, Ecklon and Zeyher 1975, type (Herb. Sond.); near Springbokkuil, Zeyher 2897! (Herb. Sond.).

C. Marlothii Schonl.⁽³⁾ was described by its author from specimens gathered at Laingsburg (Central Region) by the late Dr. R. Marloth in 1902. In habit and leaf shape it comes nearest to *C. filicaulis* E. & Z., from which it differs among others in the shape of its leaves, differing also from *C. mammillaris* Linn. f. in the same characters already noted for the former, as well as in habit. In this character, too, it resembles *C. hemisphaerica* Linn., but differs from this in its fusiform terete leaves. From the Botanical Magazine plant it differs by its very much shorter racemose inflorescence in which the flowers are singly borne at the nodes and differently coloured, and by its much dwarfer habit. Berger⁽¹⁾ was therefore correct in regarding *C. Marlothii* Schonl. as a distinct species under *Adromischus* Lem.:

9. A. Marlothii (Schonl.) Berger l.c. 416.

Cotyledon Marlothii Schonl. l.c. 59.

C. mammillaris Schonl. l.c. 153, *in part. non Linn. f.*

CENTRAL REGION—Laingsburg distr.: Near Laingsburg, July 1902 (*flor. in Hort. Alb. Mus.*, Feb. 1903), Marloth 1520! Type (Herb. Alb. Mus.).

The Botanical Magazine plant thus appears to be distinct from all three species treated above, and must therefore under International Rules have a new name, for which the following, with details of synonymy, is proposed:

10. *A. kleinioides* C. A. Sm. nom. nov.

Cotyledon mammillaris Hook. f. in Bot. Mag., Vol. 99, t. 6020 (1873); Schoul. l.c. 153, *partim*; non Linn. f.

Stem up to 50 cm. high and 2 cm. thick, ascending erect or ascending, sparingly branched, with decurved tips, glabrous. *Leaves* alternate and scattered, spindle-shaped, acute, narrowed to a broad base, up to 6 cm. long and 1.3 cm. thick, terete, glaucous-green, glabrous. *Spike* up to 30 cm. long, at length pendulous, glabrous in all parts; flowers in 3-flowered nodal cymes in the lower part, with only the middle flower evident in the younger stages of development in the upper part, the lateral flowers strongly divergent. *Corolla-tube* dull yellowish-green or brown, up to 1.5 cm. long; limb dull reddish-brown, on both surfaces, up to 6 mm. in diam., spreading-reflexed, with the lobes undulate and furnished with long apical subulate processes. *Nectarial scales* minute, orbicular and notched.

WESTERN REGION—Namaqualand Minor (*without precise locality or collector*).

This exceedingly handsome species is thus far apparently known only from the fine coloured plate in the Botanical Magazine, the original specimen not being kept.

11. *A. mammillaris* (Linn. f.) Lem. ex Berger.

It is difficult to understand how this species, even though considered only from Thunberg's fairly detailed description, could have been confused with the three preceding (see also notes under these), so that for purposes of ready comparison with the notes made under them, the original description of the type by Thunberg (though first shortly described and named by the younger Linnaeus) is here given in full: "*Caulis* repens, radicans, carnosus, teres, glaber, crassitie dimidia calmi, ramosus, cinereus. *Folia* subpetiolata, secunda, verticillata, instar mammillae, utrinque attenuata, obtusa, carnosae, unguicularia, cinerea. *Pedunculus* longus, filiformis, spithameus. *Flores* patentes, subpedunculati; pedunculi breves. *Tubus* cylindricus, angulatus, viridis, glaber, unguicularis. *Limbus* 5-lobatus, plicatus, patenti-reflexus, albido-purpureus, vix lineam longus. *Filamenta* 10, quorum 5 longitudine tubi et 5 breviora, tubo inserta, capillaria, albida. *Antherae* minutae, ovatae, pallidae. *Stigmata* 5, truncata. *Styli* 5, subulati, longitudine staminum, breviorum. *Capsulae* quinque."

***A. mammillaris* (Linn. f.) Lem.** in Jard. Fleur. II, Misc. 60 (1852), *ex Berger*, l.c. 416.

Cotyledon mammillaris Linn. f., Suppl. 242 (1781); Thunb., Prod. 84 (1794); & Fl. Cap. Ed. Schult. 377 (1823); DC., Prod. Vol 3, 398 (1828); non Haw. (1821).

CENTRAL REGION—Oudtshoorn distr.: "Olifantsbad", Dec., Thunberg! Type (Herb. Upsala); in a poort on Bokkeveld series, between Oudtshoorn and Montagu Pass, April 1930, van Nieuhuys! s.n. (Pa). Robertson distr.: On karoo-like hills, near Robertson, March, Galpin 10334! (Pa). Ladismith distr.: On hills near Ladismith, Dec. 1926, Liebenberg 620! (Pa).

N.B.—The plant (*Herb. Norm. Austro-Afr.* 1860!) distributed by Macowan as "*C. mammillaris* L. f.", is *A. Marianae* (Marl.) Berger.

The leaves of the above species are unspotted, Berger (*loc. cit.*) erroneously placing the species in his key under the group with richly spotted leaves, and so close is the resemblance of the plant in habit and foliage to some specimens of *Kleinia radicans* (Thunb.) Haw. [Phil. Mag. Vol. 62. 381 (1823)] and *K. gonoclada* DC. (Compositae), that distinction between non-flowering specimens of these species is nearly impossible. In the fresh condition, however, the species are readily distinguished by the turpentine-like flavour of the broken leaves of the two species of *Kleinia* and the pale greyish-green longitudinal band which marks their "midrib." These characters are not met with in *A. mammillaris* (Linn. f.).

The inflorescence described in detail by Haworth (Rev. Pl. Succ. 21 : 1821) as belonging to *C. mammillaris* is clearly that of another species of *Cotyledon*. This inflorescence, which Haworth had "ex horto regio Kewense . . . in Junio 1819", showed the following outstanding features: "*Flores* terminales in racemo 3-4-floro parum paniculato . . . *Pedunculi* graciles 6-12 lineares, erecti nutantesve, cum calycibus uti corollis, ramenatceopubescentes . . . *Corolla* ventricosa . . . sordide fulvescens, laciniis 5 subrevolutis acutis . . . *Filamenta* 10, sordide flavescentia, lente villosa . . ."—characters which agree perfectly with those observed in the inflorescence of typical *Cotyledon ventricosa* Burm. f.

12. *A. tricolor* C. A. Sm., sp. nov.

Planta perennis, succulenta, in omnibus partibus glabra. *Caules* breves (ad 3 cm. alti, ut videtur), crassi, simplices. *Folia* opposita et decussata, oblongo-cylindrica ad oblongo-elliptica, teretes, ad basin molliter angustata, apice subobtusata, ad 6 cm. longa et 7 mm. lata, carnosa, in medio parte crassissima, cinereo-viridia sed maculis purpureo-brunneis omnino notata. *Inflorescentia* terminalis, spicata, simplex, vel 1-2-ramosa; rhachis rigida, erecta, ad apicem subcernua, ad 25 cm. longa (pedunculus inclusus); ramuli ascendentes, breves, pauciflori. *Flores* in cymulis 1-floris laxè dispositi, bracteis patentibus lanceolato-subulatis membranaceis. *Calyx* carnosus, viridis; dentes ovato-deltoides, acuminati, ad 1.5 mm. longi, saepe post fructus persistentes et spinescentes. *Tubus corollae* cylindricus, rectus, obscure 5-angulatus, ad 1.5 cm. longus, viridis; lobi ovato-lanceolati, acuminati, superne albi vel purpureis suffusi, inferne rubri; limbus patens, deinde subreflexus. *Ovaria* oblique-ovata, in stylo subulato longe angustata. *Squamae nectarii* obovato-cuneatae, e marginatae, plus minusve dentibus calycis aequantes.

WESTERN REGION—Clanwilliam distr.: On dry hills near Brandvlei, 1,200 ft., Jan. 1896, *Schlechter* 9933! Type (Pa).

13. *A. Cooperi* (Baker) Berger.

First described from material collected by Thomas Cooper on the Zuurberg Range (Uitenhage distr.) in 1860, and so far apparently known only from the excellent type figure in Saunders' Refugium Botanicum, Vol. I. t. 72 (1869), made from Cooper's specimens which flowered at Reigate. It is certainly one of the most distinct in the genus, being characterised by its terete or subterete leaves which are markedly blotched all over and uniquely flattened into a broader ovate-rotundate ("spatulately dilated", Baker) spotted apical portion, and by the beautiful wine-red corollas with little papillae on the upper face of the basal parts of the lobes. Yet Schonland and Baker f. (*loc. infra cit.*) suggest that it "may only be a varietal of *Cotyledon maculata* Salm Dyck"! of which incidentally Schonland had anything but the correct conception (see note under No. 1). It is far more nearly allied to the next species and *A. festivus* C. A. Sm., the next but one, but from the former it is readily known by its spotted opposite leaves, while the latter differs in the curious apical portion of its alternate leaves, as well as in floral characters—wider and shorter corolla-tube, differently coloured parts, and absence of papillae.

***A. Cooperi* (Baker) Berger, l.c. 416.**

Cotyledon Cooperi Baker in Saund., Ref. Bot. I. t. 72 (1869); Schonl. & Bak. f. l.c. 91; Schonl. l.c. 153.

SOUTH EASTERN COASTAL REGION—Uitenhage distr.: On the Zuurberg Range, anno 1860, *Cooper*! s.n. Type (*ic. col. tant. vidi*).

14. *A. pachylophus* C. A. Sm., sp. nov.

Cotyledon Cooperi var. *immaculata* Schonl. & Bak.f. l.c. 92.

Planta perennis, succulenta, in omnibus partibus glabra. *Radices* ab eis originationibus tuberosi, in ramulis fibrosis angustati. *Caules* breves (ad 3·5 cm. alti) crassique (ad 1·3 cm. diam.), simplices vel ad apicem bifurcati ramulis brevissimis crassis, ad apices foliosi. *Folia* 4-6 alterna et subdecussata, laxè disposita, oblongo-cylindrica sed ad basin in parte brevè teretè crasso abruptè angustata instar petiolata, et tertia parte superiore in apice ovato-rotundata ad 3·5 cm. lata obtusa immaculata depressissima et expansa, ad 7 cm. longa, carnosissima, glauco-viridia, immaculata. *Inflorescentia* laxè spicato-racemosa, ad 30-flora; rhachis simplex vel ramosa, erecta, ad 30 cm. longa (pedunculus inclusus). *Flores* sessiles vel subsessiles, in cymulis 1-floris laxè dispositi, bracteis patentibus deltoideo-acuminatis membranaceis. *Calyx* subcylindricus, carnosus, glauco-viridis; dentes ovato-acuminati, ad 2 mm. longi. *Tubus corollae* cylindricus, rectus, ad 1 cm. longus, viridis sed superiore dimidia parte pallido rubro suffusus; lobi ovati, acuminati, ad 4 mm. longi. epapilloso, pallidi rubri. *Ovaria* 4-5, oblique oblònga, in stylo subulato longè angustata, stigmatis capitatis. *Squamae nectarii* obovato-cuneatae, emarginatae, dentibus calycis in dimidio parte aequantes.

CENTRAL REGION—Graaff-Reinet distr.: Mountain side near Graaff-Reinet, Nov. 1897, Rattray! s.n. Type (cult. Hort. Alb. Mus. annis sequentis). Queenstown distr.: On Bowker's Kop, near Queenstown, 3,800 ft., Nov. 1896, Galpin 2209! (Pa).

Galpin's material here cited showed one of the uppermost leaves on each of the specimens on his sheet, and these were distinctly smaller than the dimensions given by Schonland and Baker f.(4) for the leaves of their material. In other details, however, Galpin's specimens agreed very well with the rather scanty details given by the authors cited, and the writer has little doubt as to the conspecificity of the Rattray and Galpin specimens. Both localities should again be combed for additional material for purposes of verification, and for further amplifying the description. In the above, inflorescence details and basal parts were taken from Galpin's specimens and the leaves only described from the Rattray plant.

This species is most closely allied to the previous one, but from this it is readily known by its unspotted alternate leaves of which the apical crest is far more markedly expanded, and by the epapillose bases of the corolla lobes.

15. *A. festivus* C. A. Sm., sp. nov. (Fig. 3).

Planta perennis, succulenta, in omnibus partibus glabra, sed omnino pulvo albescente (Anglice "bloom" dicta) tenuiter oblecta. *Caules* robustus, ad 4 cm. alti, sed speciminibus cultis multo altior et saepe ad basin foliorum nodis radices adventitiosas emittentes. *Folia* opposita decussataque, ovoideo-cylindrica, gradatim et obtuse ad basin tertia parte inferiore in parte brevè multo angustiore teretè circa 5 mm. longè angustata instar crassiter petiolata, deinde abruptè in amplio basi amplectente expansa, molliter ad apicem deltoideum vel rotundatum vel obtusum saepe crispulatum maculatum depressissimum attenuata, ad 5 cm. longa et 1·5 cm. lata, carnosissima, teretia vel subteretia, cinereo-viridia, maculis purpureo-brunneis pulchriter omnino notata (maculae frequenter infra apicem mergentes), patentè-ascendèntia et saepe incurvata. *Inflorescentia* laxè spicata, simplex; rhachis erecta, ad 35 cm. longa (pedunculus inclusus). *Flores* in cymulis 1-floris laxè dispositi, bracteis deltoideo-ovatis acuminatis membranaceis. *Calyx* viridis, carnosus, cupuliformis; dentes deltoidei, subacuminati, ad 1·5 mm. longi. *Tubus corollae* cylindricus, viridis vel pallido-viridis, ad 8 mm. longus; lobi ovato-acuminati, ad 2 mm. longi, superne alba vel pallido roseo suffusi, inferne rubri. *Ovaria* semi-ovoidea, longè in stylo acuminato angustata; stigmata capitata. *Squamae nectarii* obovato-cuneatae, emarginatae, calycis dentibus subaequantes.

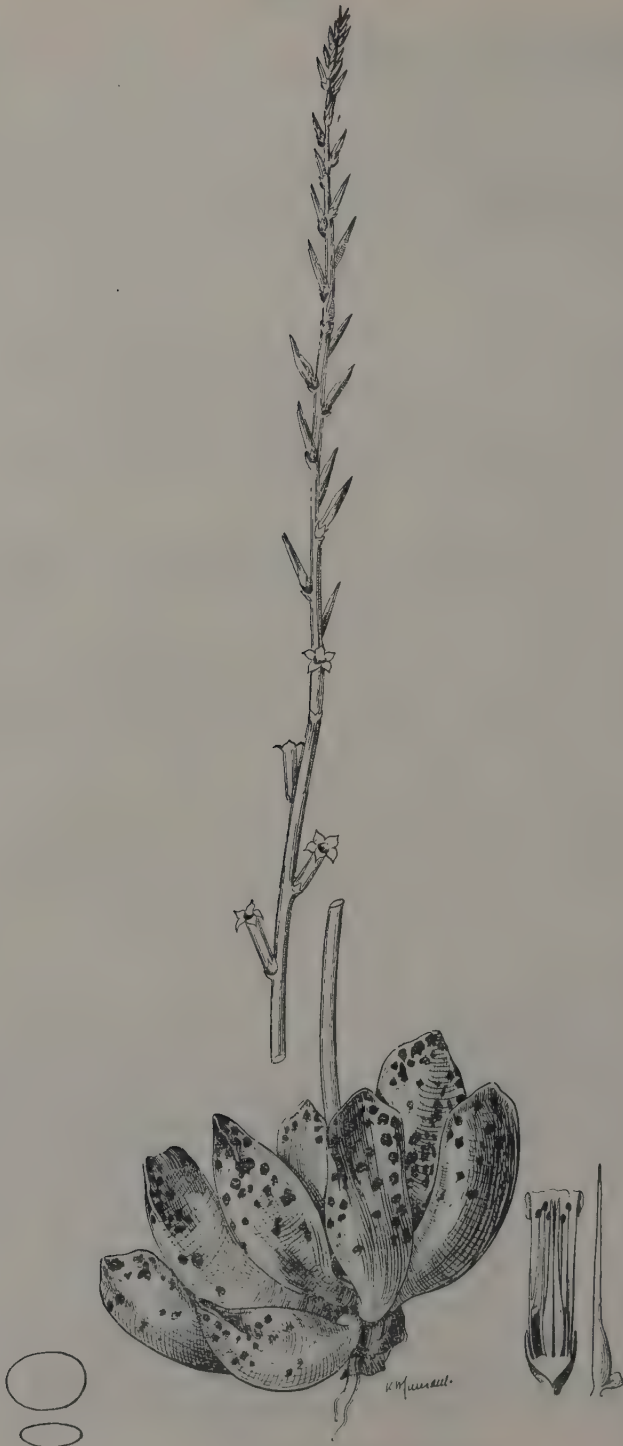


FIG. 3.—*A. festivus* C. A. Sm. (see text).

CENTRAL REGION—Graaff Reinet distr. : Near Graaff Reinet, on slopes of rocky hill above the reservoir, April 1926 (flowering at the Division of Plant Industry, Dec. 1926), *Smith in Nat. Herb.* 8876 ! Type (Pa).

The accompanying plate (Fig. 3) was made from the type specimen at the time of flowering (Dec. 1926).

The type agrees exactly with a photograph of a specimen cultivated by the late Dr. N. E. Brown in his conservatory at Kew during July 1920, and sent by him to the Division of Plant Industry, Pretoria, sometime after the specimen had flowered in January of the following year, together with the name which is here taken up for the first time.

It is most closely allied apparently to *A. Cooperi* (Baker), but may be readily known from this by the shape and colouration of the leaves and their different apices, as well as the absence of the peculiar papillae on the corollas of its ally.

16. *A. Zeyheri* (Harv.) von Poellnitz in Cactus Journ., 1938, 68.

This species was regarded by Berger⁽¹⁾ as conspecific with *C. cristata* Haw., probably following on a note by Schonl. & Baker f.⁽⁴⁾. The absence, however, of the very characteristic shaggy reddish aerial roots from the stems and the pubescent peduncles and corollas easily serve to distinguish it from the latter. The stems of the type plant are also "half-recumbent, rooting at the nodes" (Harv.), a condition not observed in *C. cristata* (Haw., so that the plant will bear the following name under *Adromischus* Lem. :

***A. Zeyheri* (Harv.) von Poellnitz l.c.**

Cotyledon Zeyheri Harv. l.c. 397 ; Schonl. & Baker f. l.c. 91 ; Schonl. l.c. 155.

SOUTH WESTERN REGION—Swellendam distr. : "Rocky places on the Kenko Rivier, east of the Buffeljachts Rivier", *Zeyher* 2571 ! Type (Herb. S. Afr. Mus.).

Schonl. and Baker f. also cite *Ratray* (*sine num.*) from Graaff-Reinet and *Schonland* 709 from "rocky places near Grahamstown" under the above species, stating "they have been compared with *Zeyher*, no. 2571, . . . and also with the type of *C. cristata* Haworth (Phil. Mag. 1827, 274), and we think these two species should be united".

The differences between the two species have been indicated above, and the writer has no hesitation in referring the two specimens just cited to *A. cristatus* (Haw.) ; *v. seq.*

17. *A. cristatus* (Haw.) Lem. ex Berger.

See also note under the previous species for distinguishing features between it and *A. Zeyheri* (Harv.), and under the following species for other differences between it and *A. clavifolius* (Haw.), with both of which it has been confused. Thus, as previously noted, Schonland and Baker f.⁽⁴⁾ unite it with *A. Zeyheri* (Harv.)—as species of *Cotyledon*. However, so doubtful was Schonland himself of this that in his last paper on *Cotyledon*⁽³⁾ he resuscitates *C. Zeyheri* Harv., but unites *C. clavifolia* Haw. with *C. cristata* Haw., keeping up the latter name. The following are the full details of synonymy and citations for the species under *Adromischus* Lem. :

***A. cristatus* (Haw.) Lem.** in Jard. Fleur. II, Misc. 60 (1852), *ex Berger*, l.c. (416), *excl. syn. Zeyh.* Jacobsen, Succ. Pl. (Eng. trans.), 17 (1935), incl. fig. 2 *sed excl. syn. C. Zeyheri* "Haw."

Cotyledon cristata Haw. in Phil. Mag. 1827, 274 ; DC., Prod. Vol. 3, 399 (1828) ; Eckl. & Zeyh., Enum. 307 (1836) ; A.P. & A. DC. in Mem. Soc. Phys. Hist. Gen. Vol. 7 t. 7 (1836), *bona* ; Harv. l.c. 376 ; *partim, excl. syn. Haw.* ; Schonl. l.c. 155, *partim. et excl. syn. Haw.* ; Marl., Fl. S. Afr. Vol. 2, 1-20, t. 9-5 (1925) ; Phill. in Flow. Pl. S. Afr. Vol. 9, t. 325 (1929). *C. Zeyheri* Schonl. & Baker f. l.c. 91, *excl. spec. Zeyh.* ; non Harv. (1861-62).

SOUTH-EASTERN COASTAL REGION—Uitenhage distr.: (*sine loc. exact.*), *Bowie!* s.n. Type in Herb. Haw., Oxon.: dry hills on the Zwartkops Rivier, E. & Z. 1974, *partim* (Herb. Sond.): Port Elizabeth distr.: At Redhouse on dry hills, April 1915, *Mrs. Paterson* 442A! (Pa).

CENTRAL REGION—Albany distr.: In rocky places, near Grahamstown, *Schonland* 709! (Herb. Alb. Mus.). Graaff-Reinet distr.: At Graaff-Reinet, *cult. spec. plur. e Hort. Div. Pl. Ind. in Nat. Herb.* 7945! *et viv. spec.!* (Pa); dry hills near Graaff-Reinet, Nov. 1897, *Ratray!* s.n. (Herb. Alb. Mus.); occasional along basal slopes of mountain, near Graaff-Reinet, March 1930, *Galpin* 10275! (Pa).

Haworth's type specimen is preserved in his herbarium at Oxford, and is represented in the Kew collection of drawings by an exceedingly fine accurate coloured plate (No. 264) made from specimens sent by Bowie from the Cape (undoubtedly from the Uitenhage division) to Kew in 1823, the plate being prepared when the plants flowered in September 1826. That the original of the plate and Haworth's specimen both came from the type gathering is evident from the date of flowering cited and the fact that Haworth notes that his specimen flowered at Kew (Sept. 1826), N. E. Brown noting that he compared the plate with Haworth's type and found them to agree perfectly (Oct. 1901). Moreover, there is ample reason to believe that, in view of the rarity of the material sent by Bowie, a single specimen was figured and this same specimen passed on to Haworth.

This plate has also been very carefully compared with the original of the "Flowering Plants" coloured figure and found to match exactly, both also agreeing in every respect with A. P. & A. De Candolle's fine plate cited above.

18. *A. clavifolius* (Haw.) Lem. ex Berger.

This species was regarded by Harvey⁽²⁾ as doubtfully conspecific with the previous species, but, though regarded as distinct, from *C. cristata* Haw., with which Schonland and Baker f. (4) had united *C. Zeyheri* Harv., Schonland⁽³⁾ reversed this by excluding the last species, but united *C. clavifolia* Haw. with the former under that name. This latter step is by no means justified by reference to the type material and excellent figures, for they show most marked foliage and even floral differences. This was already noted by Haworth (Phil. Mag, 1827, 274) where he states "Priori (i.e. *C. cristata* Haw.) valde affinis at abunde distincta videtur. Folia subtriangularia, plusquam duplo angustiora, petiolo [*sic!*] incurvo, vix puberulo, ramentis caulinis forte paucioribus: cum eodem modo florendi; tubo subincurvo robustiore, viridi; laciniis intus albis, extus (uno latere) purpureis, et basi undulato-sublobulatis ut in priori". There is no specimen of *C. clavifolia* Haw. in Haworth's herbarium at Oxford, but there is a very fine coloured plate of a plant so-named in the collection of drawings at Kew, and, as explained under the previous species, there is every reason to believe that the plate represents Haworth's type, or at least an identical specimen, the material coming from the same source as the former species and flowering at Kew at the same time, Sept. 1826. This coloured plate must therefore, in the absence of a type specimen be chosen as the type.

The original specimen of the plate given in "Flowering Plants" (cited below) agrees perfectly with this plate, having been compared with it at Kew by the writer, and, as the original collections from which tt. 325, 328 of this publication were made, are still (1932) in cultivation at the Division of Plant Industry, Pretoria, where they had then been growing in the same greenhouse under similar conditions for nearly 6 years, typical specimens of the two Haworthian species were available for comparison. Thus the longer ovoid-elliptic to subcylindric terete dark green "body" of the leaves of *C. clavifolia* Haw., with their flattened but scarcely or not crisped and more or less abruptly constricted apices, contrast markedly with the much shorter dorso-ventrally somewhat compressed obovoid-cuneiform

to flabelliform paler green "body" of the leaves of *C. cristata* Haw. with their flattened and conspicuously crisped or undulate scarcely or not at all constricted apices. Their floral differences can best be seen by comparison of the two plates already cited.

Schonland and Baker f. (4) have suggested that in leafshape "it is more nearly allied to *C. Cooperi*", but in this character it is far more nearly allied to *A. festivus* C. A. Sm., which has the same type of leaf apex. In the possession of the peculiar "petiolar" leaf base, however, *A. clavifolius* (Haw.) is far more nearly related to *A. cristatus* (Haw.) and *A. Zeyheri* (Haw.), with which it also agrees in indumentum and inflorescence characters, so that these two species would seem to be its closest affinities. The following would be the synonymy and citations under *Adromischus* Lem. :

A. clavifolius (Haw.). Lem. in Jard. Fleur. II, Misc. 60 (1852), ex Berger, l.c. 416, f. 199, B—E (1930) ; Jacobsen, Succ. Pl. (Eng. trans.), 16, excl. ref. fig. 6, 1, quae est spec. distincta.

Cotyledon clavifolius Haw. in Phil. Mag. 1827, 274 ; DC., Prod. Vol. 3, 399 (1828) ; Schonl. & Bak. f. l.c. 92 ; Schonl. l.c. 155.

C. cristata Harv. l.c. 376, *pro parte* ; *non* Haw. (1827).

C. Schonlandii Phill. in Flow. Pl. S. Afr. Vol. 9, t. 328 (1929).

"*A. van der Heydeni* Hort." ex Berger (*loc. supra cit.*).

A. Schonlandii (Phill.) von Poellnitz in Cactus Journ. 1938, 68.

SOUTH EASTERN COASTAL REGION—Uitenhage distr. : (*sine loc. exact.*), Bowie ! Type (*ic. col. ined. tant. Herb. Bot. Reg. Kew. vidi*) ; on dry hills on the Zwartkopsrivier, Dec., Eckl. & Zeyh. 1974, *partim* (Herb. Sond.).

CENTRAL REGION—Graaff Reinet distr. : Near Graaff Reinet, *cult. spec. plur. e Hort. Div. Pl. Ind. in Nat. Herb.* 7944 ! (Pa, K).

In Harvey's description of *C. cristata* Haw., principally drawn from E. & Z. 1974 (Herb. Sond.), he states "leaves 1-1½ inches long . . . varying in breadth from 2 to 6-8 lines ; the narrower forms answer to the description of Haworth's *C. clavifolia*". Both these two species grow in the same locality, and, though the writer has not seen the Herb. Sond. specimens of E. & Z.'s gathering, there can be no doubt that this number is composed of a mixture of the two plants, a point sufficiently evident from Harvey's observations. E. & Z. (Enum. 307 : 1836) only list "*C. cristata* Haw." under their number 1974, but without descriptive detail.

19. *A. leucothrix* C. A. Sm., sp. nov. (Plate I.)

Planta nana, succulenta, perennis. *Caules* crassi, ad 4 cm. alti et 3 cm. diam. eis basibus tuberosis sed gradatim ad apicem foliosum angustati e parte supra basin nudo ad 6 mm. diam. subcylindrico, simplices vel ramis e basi brevibus paucis, laeves, glabri. *Folia* alternata et circum apices caulium vel ramorum dense aggregata, lineari-oblonga ad oblanceolata vel elliptico-oblonga, vix basin angustata, sed gradatim ad apicem obtusum angustata, ad 3.5 cm. longa et 5 mm. lata, ascendenti-erecta vel inferiores patentia, carnosissima, saturato-viridia et immaculata, prope basin subteretia, profunde in facie superiore sulcata sed inferire convexa, omnini crinibus hispidis albidis dense oblecta ut in foliis *Cras-sulae mesembrianthemoidis* (Haw.) D. Dietr. *Inflorescentia* simplex, pauciflora, racemoso-spicata ; rhachis erectus vel ascendenti-erectus, debilis, in inferiore parte dense sed breviter crinibus hispidis albidis oblectus. *Flores* non visi. *Carpellae* modo generis.

CENTRAL REGION—Ladismith distr. : On the eastern slope of a hill along the Ladismith-Calitzdorp road, Dec. 1926, *Liebenberg!* s.n. Type (Pa).

The above species differs from all the other known species of the genus in the conspicuous white bristly unicellular hairs on the deeply sulcate leaves and lower part of the peduncles, thus giving these organs a distinct hoary appearance.

Described in greater part from notes made on the fresh type plant shortly after planting at Pretoria (Dec. 1926), and from the original photograph taken by the writer at that time and reproduced as Plate 1.

A later examination (April 1931) of the same plants (i.e. after they had been in cultivation in a warm green house for nearly five years) showed no variation in the density and character of the hairs on the leaves and peduncles, but the following dimensions will indicate the influence of green house conditions on a plant coming from an area with a mean annual rainfall of 15 inches. : *Stems* up to 15 cm. high and 1.5 cm. thick, with the bulbous swollen base 6 cm. in diam. *Leaves* up to 11 cm. long, 1 cm. wide and 8 mm. thick, and still with the deep sulcus on the upper face.

Apart from the character of the leaf indumentum, the species also exhibits other leaf characters (shape, cross-section, the deep groove) which make it unique in the genus, since none of the other species shows any character like it, but the nearest approach to the type of leaf in the above species is met with in *Cotyledon Wallichii* Harv., some narrow leaved forms of *C. ventricosa* Burm. f., *C. Dinteri* Bak. f., and *C. cacalioides* Linn. f., though, of course, the leaves of none of these in the fresh state show the grooving or indumentum which characterises the *Adromischus*. The non-flowering plant also bears a strong superficial resemblance to *Crassula mesembrianthemoides* (Haw.) D. Dietr. = (*Cr. trachysantha* E. & Z.), but from this it is readily known by its succulent (not shrubby) stems, alternate (not opposite) leaves and their shape (not triangular in cross-section).

20. *A. Alstoni* (Schonl. & Bak. f.) *C. A. Sm.*, comb. nov.

Described from a specimen collected by G. Alston in Namaqualand and cultivated by Dr. Schonland in the Albany Museum Herbarium garden, where it flowered in Jan. 1901. It is very closely related to *A. triflorus* (Linn. f.), from which it appears to differ in its longer but narrower leaves, in the colouration of the flowers, and in the shape of the corolla-lobes. Unfortunately, the type of *A. triflorus* (Linn. f.), Thunberg's Zeekoerivier specimen, was not available for examination, so the characters in the following table under this name were taken from Thunberg's excellent description made obviously (in greater part at least) from notes on the fresh plant at the time of collection :

<i>A. Alstoni.</i>	<i>A. triflorus.</i>
<i>Folia</i> ad 7 cm. longa et 2.5 cm. lata.	<i>Folia</i> ad 5.5 cm. longa et 2.5 cm. lata.
<i>Corollae tubus</i> viridis, ad 1.5 cm. longus.	<i>Corollae tubus</i> "viridi-rufescens, subungularis."
<i>Corollae lobi</i> deltoideo-acuminati, pallide rosei vix 2 mm. longi.	<i>Corollae lobi</i> "ovatae, obtusae, intus albae, extus rufescentes, lineam longi."

Thunberg's description does not include the leaf shape of his plant, though he says : "*folia* . . . obtusissima, subtruncata, inferne attenuata, basi teretiuscula", and from the dimensions above given, this would indicate an obovate leaf long-cuneate to the base, Alston's specimens also having the leaves obovate and long cuneate to the base and rounded at or only very slightly tapering to an obtuse apex. In the latter, too, the flowers are sometimes singly disposed along the rhachis, or in 3-flowered cymules, whereas in the Thunberg specimens, the 3-florous condition seems consistently to obtain, at least in the maturer basal half of the inflorescence.

The species appears to have been omitted by Berger (¹), hence the following new combination is proposed for it under *Adromischus* Lem. :

A. Alstoni (Schonl. & Bak. f.) *C. A. Sm.*, comb. nov.

Cotyledon Alstoni Schonl. & Bak. f. l.c. 93 ; Schonl l.c. (154).

A. Cooperi Jacobsen, succ. Pl. (Engl. trans.) 16 (1935) excl. syn. ; non Berger.

WESTERN REGION—Namaqualand Minor (*sine loc. exact.*), anno 1900, *G. Alston* ! *s.n.* Type (Herb. alb. Mus., K).

Of this plant the writer has only seen the dried specimens taken from the type collection at the time of flowering. Jacobsen (*loc. supra cit.*) described a plant which appears beyond doubt to be *A. Alstoni*.

21. *A. Marianae* (Marl.) Berger.

This is another of the species confined to the western area (Clanwilliam distr.) of the Cape Province, and is well characterised by its oblong greyish-green fleshy leaves which show a more or less semicircular cross-section and are conspicuously marked with purple-brown flecks and blotches over their whole surface. The fine coloured plate of the plant cited below also shows a rooting leaf, which had originally broken off from a fresh specimen and left lying on a shelf in the late Dr. R. Marloth's laboratory. Here, after a period of several months, the leaf developed adventitious roots and new leaves at its base.

A. Marianae (Marl.) Berger, l.c. 416.

Cotyledon Marianae Marloth in Trans. S. Afr. Phil. Soc. Vol. 18, 47 (1907) ; Schonl. l.c. 153 ; Marl., Fl. S. Afr. Vol. 2, 1. 14. t. 3, f. A (1925), *bona*.

WESTERN REGION—Clanwilliam distr. : Stony slopes of a mountain near Clanwilliam, 1,000 ft., March 1898, *Leipoldt in Herb. Norm. Austro-Afr. Cent. XIX*, 1860 ! (K, Pa).

Leipoldt's specimen was erroneously distributed by MacOwan in 1899 as "*Cotyledon mammillaris* Linn. f.", but agrees with every detail of the fine plate of the type plant, of which, however, the writer has not seen the dried material.

22. *A. humilis* (Marl.) Berger.

One of the most distinct species in the genus, with the following most outstanding characters : A dwarf succulent perennial without any sign of a stem. *Root* tuberous below the crown. *Leaves* flat, rosulate, alternate. *Peduncle* very short, laxly 2-5-flowered, the 7-flowered condition only found in cultivated specimens. *Corolla-tube* yellowy-green and slightly tapering to the base ; limb stellately spreading or at length reflexed, deep purple to maroon.

A. humilis (Marl.) Berger, l.c. 417.

Cotyledon nana Marl. in Trans. Roy. Soc. S. Afr. Vol. 2, 33 (1910) ; non N. E. Br. (1902).

C. humilis Marl. apud. Schonl. l.c. 151 and Fl. S. Afr. Vol. 2, 1. 16, 17. t. 3, f. D (1925), *bona*.

CENTRAL REGION—Beaufort West distr. : On the Nieuweveld Mtns., Dec. 1909, *Marloth* 4689 ! Type (Pa).

So far only recorded from this locality, which in the early half of last century was one of the fruitful collecting grounds of Marloth's countryman, the equally energetic J. F. Drège, but he appears to have missed the plant altogether.

23. *A. nanus* (N. E. Br.) von Poellnitz (Pls. II., III.)

This species was first described (as *C. nana* N. E. Br.) in 1902 from a plant sent "in 1899 by Prof. MacOwan from South Africa to Kew" where it is still alive and flourishing (1930), being for some time cultivated in the late Dr. Brown's conservatory at Kew, and there photographed in Sept., 1920. An authenticated photo of the plant (Plate II) was shortly afterwards sent to the Division of Plant Industry, Pretoria, but the original description appears to lack some of the details which are evident even in the photo, such as the subdistichous arrangement of the leaves which are among the smallest in the genus.

The locality from which MacOwan originally obtained his plant (the type) is not known, but almost certainly it came from Middelburg (Cape), whence he had plants sent him in 1898-99. That this part of the central region may be involved is further indicated by the fact that a plant collected by Dr. T. R. Sim in January, 1902 at Hanover, in the district adjoining Middelburg, agrees in every essential detail as far as vegetative parts are concerned with N. E. Brown's type. The latter, however, at the time it was described, bore only a very short ("½ inch long") peduncle, with a single, apparently terminal, flower, whereas Sim's specimen shows the typical raceme found in the species belonging to the northern group (cf. p. 615). That the inflorescence of the type plant is not a normal one is amply borne out by the fact that even in the wild state, this group is frequently seen to produce abnormal floral features, a condition even more frequently met with in cultivation, where soil, water, or biotic factors may even retard flowering for several years! Some, or all of these factors seem to have operated in the type plant, since it has not flowered once again so far as observation at Kew has shown during the last 30 years, and even its leaves remain far smaller than those of wild specimens which are beyond doubt conspecific. As Brown also cautiously observes (*loc. infra cit.*), "the one-flowered peduncle may not be a constant character, as other species of the group have a spicate [or racemose] inflorescence". The following description, which will serve to amplify the original in further leaf and inflorescence detail, was drawn largely from flowering specimens (seen in Plate III) collected by the writer, and from Sim's excellently dried material, parts of the original incorporated being indicated in inverted commas:

Plant a dwarf succulent perennial, glabrous in all parts, but the leaves and inflorescence covered with a thin waxy bloom. *Stem* at most 2 cm. high, stout and fleshy, very slightly and inconspicuously 2- (or not at all) branched at the apex. *Leaves* closely crowded at the apical part of the stem (or crown of the rootstock in the subcaulescent forms), alternate (frequently apparently opposite), distichous, or subdistichous owing to overcrowding at the apices, broadly oblong-elliptic to orbicular or reniform, broadly rounded at, and never tapering to the base and apex (the latter very rarely, and then only casually, subacute), up to 1.5 cm. wide and about as much long, erect or ascending-erect, very thickly fleshy, with the thickest part (up to 3.5 mm.) in the middle, convex on either side, whence narrowly elliptic or oblong-elliptic in cross-section, thinnest towards the apical margin, the margin itself white and cartilaginous, greyish-green in colour, invariably spotted with numerous purple-red to purply-brown flecks (especially in the upper half), the blotches flowing into a continuous irregular blotch under the apex. *Inflorescence* single and simple, terminal and up to 25 cm. long (or more?), including the nude lower peduncular part, laxly racemose in the upper half or third. *Flowers* generally spreading on their short pedicels and subsecundly arranged when opening, erect or ascending-erect after fertilisation and in the bud stage. *Pedicels* up to 5 m.m. long in the fruiting stages, arising in the axils of much reduced ovate acute membranous spreading bracts, terete, more or less insensibly widening into the calyx. *Calyx* fleshy, with narrowly ovate-deltoid, very acute up to 2 mm. long teeth. *Corolla tube* cylindric, "slightly clavate", straight, obtusely 5-angled, up to 1.2 cm. long, "reddish-brown with . . . greenish-angles", or purplish-brown, and purplish in the throat; lobes reflexed, ovate-acute, up to 2 mm. long, "rosy-purple with whitish margins

and with the mouth of the tube at the sinuses somewhat membranous and whitish". "*Stamens* included; anthers ochreous-yellow". Ovaries 5, oblong-ovoid, up to 8 mm. long, and tapering insensibly into their subulate styles. *Nectarial scales* obovate to oblong-obovate, deeply notched at the apex.

The following are the details of synonymy and citations for the species which appears to have been missed by Berger (Engl. & Prantl., Nat. Pflanzenfam. XVIII, a. 416: 1930):

A. nanus (N. E. Br.) von Poellnitz comb. nov. in Desert Plant Life 227 (1938).

Cotyledon nana N. E. Br. in Gard. Chron. Ser. 3, vol. 30, 280 (1901); non Marl. (1910).

"C. B. S."—(*sine loc. exact.*, sed forsan in ditone Middelburg dicta), anno 1899, *Spec. cult. leg. MacOwan!* Type (Hort. Reg. Bot. Kew.).

CENTRAL DIV.: Hanover distr.: Hillside at Hanover, Jan., 1902, *Sim in Herb. Galpin* 5975! Lecto-type (Pa).

ORANGE FREE STATE—Fauresmith distr.: Upper half of western slope of hill on the Fauresmith Botanical Reserve, east of the town, April, 1927, *Spec. cult. leg. Smith!* (Pa).

In view of the uncertainty attendant upon cultivation and the fact that no dried specimen of the original type is preserved in Herb. Kew., the writer would suggest that Sim's specimen above cited be chosen as the type of the specific name, the specimen being perfectly complete in all details.

The following are the associated plants shown in the photograph reproduced as Plate III, reading from left to right: *Crassula obvallata* L., *Adromischus nanus* (N. E. Br.) von Poelln., * *Kleinia radicans* (Thunb.) Haw., lying prostrate in the foreground, *Crassula obvallata* Linn., with the dried remains of the previous season's inflorescence, *Euphorbia aggregata* Berg. (spiny), *Haworthia tessellata* Haw., with its fruiting inflorescence lying over the *Crassula* just obliquely above it, † *Cotyledon toxicaria* C. A. Sm., with a dried inflorescence on it, and ‡ *Eustachys paspaloides* (Vahl) Lanza & Matti in the right background. The dried objects in the foreground are leaves of the *Haworthia* and the *Cotyledon*, together with 3 old capsules of the latter.

24. **A. procurvus** (N. E. Br.) C. A. Sm.

Known so far only from a single cultivated specimen, the type being preserved in Herb. Kew., being chiefly characterised by its curved corolla-tube. In a genus of some 30 species, all with straight corolla-tubes, an unusual character such as a curved corolla-tube is of special interest, but, in as much as many of the species are subjected to teratological modifications resulting from mechanical or biotic (e.g. aphid) injury, the curvature of the corolla tube in this particular case may have been due to such injury. In the meantime, until experimental evidence has been obtained in this direction, and for the purpose of calling attention to the plant, its specific rank is here maintained under *Adromischus* Lem., from which it was omitted by Berger (Engl. & Prantl, Nat. Pflanzenfam, Vcl. 18, a. 416: 1930).

A. procurvus (N. E. Br.) C. A. Sm., comb. nov.

Cotyledon procurva N. E. Br. in Kew Bull. 1912, 276; Schoul. l.c. 151.

"C. B. S."—(*sine loc. exact.*), *Spec. cult. Hort. Bot. Reg. Kew!* (K). Type.

It is most closely allied to the next two species, from which, however, it must, at least for the present, be excluded by its curved corolla tube, if not on foliage characters also.

* Erroneously cited as of "DC." by Harv. l.c. (317).

† *C. decussata* Phill. & C. A. Sm. in Flow. Pl. S. Afr. Vol. 8, t. 289 (1928); non Sims (1824).

‡ *Eustachys* (*Chloris*) *petraea* Auct.; non *Chloris petraea* Swartz.

25. *A. trigynus* (Burch.) von Poellnitz.

Known only from a few specimens collected in Griqualand West by Burchell in Dec. 1811, but they are incomplete as to leaves, these having apparently been lost, so that the species requires to be recollected in the type locality (*v. infra*), when a fuller description of the vegetative as well as floral parts may be drawn up, and its specific identity determined in terms of the preceding and the next species. The specific epithet "*trigyna*" is inappropriate and misleading, since in the type specimens the number of carpels vary from 3-4 5, with the last number probably the more usual as in the other species of the genus. Thus Baker fil. & Schonland⁽⁵⁾ also observe that in the flower dissected by them from the type, the normal number of carpels was found. In the matter of descriptive detail, the following, a copy of Burchell's original field label, represents all that is known as to leaf characters :

" 1898—

Cotyledon trigyna B. folia cuneato-ovata (vel suborbiculata), glabra complanata carnosae. Acaulis. Flores scapo elongato simplici (rarissimo bifido), basi nudo alterni erecti. Corolla cylindrica purparascens limbo albo brevi reflexo. Faux purpurea. Capsula tres.

Dec. 14, 1811.

At Klaarwater, in the kloof near the Burying Ground."

Burchell's final published description was no more than a re-arrangement of the characters already noted on his field label, with the addition "*flores erecti alterni*", and to these the above two authors added "*Calyx lobes lanceolate subacuminate, \pm 2 mm. long. Corolla tubular, much longer; the tube (sphalm. "*calyx*") \pm 1.3 cm. long; lobes reflexed or sub-reflexed, about 2 mm. long, acute.*"

A. trigynus (Burch.) von Poellnitz in Fedde Rep. 44, 60 (1938).

Cotyledon trigyna Burch., Trav. Vol. 2, 226 (1824); DC., Prod. Vol. 3, 398 (1828); Harv. l.c. 378; Schonl. & Bak. f. l.c. 91; Schonl. l.c. 153.

GRIQUALAND WEST—Hay distr.: At Klaarwater (=Griquatown) "in the Kloof near the Burying Ground", Dec. 1814, Burchell 1898! Type (K & Herb. DC.).

Those plants, chiefly from the Transvaal Highveld, which have been identified as this species, belong to the next but one.

26. *A. rupicolus* C. A. Sm., sp. nov. (Fig 4.)

Cotyledon trigyna Marl., Fl. S. Afr. Vol. 2, 1. t. 2, f. D (1925); non Burch. (1824).

C. rhombifolia var. *spathulata* N. E. Br. ex Marl. (*loc. cit. in icon.*).

Planta humilis, succulenta, perennis, in partibus omnibus glabra. *Caules* ad 4.5 cm. alto, crassi, simplices vel ramis brevissimis crassissimis, circum apices dense foliosi, et parte inferiore frequenter prostrati, tum ad 2.5 cm. crassi et terra semi-obtecti. *Folia* opposita decussata, late oblongo-elliptica ad suborbicularia, vix ad basin late amplectentem angustata, apice rotundata, rarissime emarginata vel mucromata, ad 5 cm. longa et 2 cm. lata, carnosissima, superne inferneque convexa, ad 4 mm. in medio crassa, sed ad apicem et margines cartilagineas angustiora, viridia, semper irregulariter maculis saturatoris viridibus maculata, sed maculis purpurascensibus vel purpureo-brunneis sub marginibus apicis dense collectis. *Inflorescentia* ex planta singula 1-2, simplex, racemosa, ad 50 cm. longa (pedunculo nudo incluso); rhachis subflexuosus vel rectus, plus minusve rigidus sed prope apicem

subcernuus, brunneus vel purpureus, teres. *Flores* longe pedicellati, postanthesin subsecundi, sed post florentem ascendentes. *Pedicelli* ad 1 cm. longi, post florentem ad 4 cm. elongati, debiles, teretes, pedunculo concolorosi, bracteis ad 1 mm. longis ovatis carnosus. *Calyx* viridis, carnosus; dentes ovato-lanceolati, acutissimi, ad 2 mm. longi, carnosi. *Tubus corollae* cylindricus, rectus, ad 1.5 cm. longus, obtuse 5-angulatus, rubro-purpureus, fauce purpureus vel saturate ruber; lobi ovati, acuti, ad 2 mm. longi, reflexi, pallidissimi purpurei vel in senioribus albescentes, inferne saturate purpurei, marginibus undulatis vel crispulatis. *Stamina* 2-seriata, plerumque 4 exserta, alia inclusa; filamenta saturate purpurea, plerumque 4 paululum altiora in tubus corollae quam aliis inserta; antherae ovoideae, albescentes. *Ovaria* 4-5, oblongo-ovoidae, ad 1 cm. longa, ad basin paululum cuneata, in stylo subulato ad apicem angustata; styli sub antheras staminum exsertorum breviter excurvati. *Squamae nectarii* obovatae, manifeste emarginatae.

CENTRAL REGION—De Aar distr.: On the slope of a hill to N.W. by W. of De Aar, in rocky crevices almost right under stones, Nov. 1926, *Liebenberg* 263! (Pa).

ORANGE FREE STATE—Fauresmith distr.: On the Fauresmith Veld Reserve, near the crest of the hill among rocks and in crevices of rocks, 4,650 feet, Dec. 1937, *Smith* 5203! Syn-type (Pa), & in eod. loc., Jan., 1928, *Smith* 5603! Type (Pa).

WESTERN TRANSVAAL—Marico distr.: Among rocks at Zeerust, 4,000 feet, Dec. 1926 *van der Merwe* 37! (Pa).

This species, figured in the accompanying illustration (Fig. 4), is locally known as "plakkie" or "bontplakkie", and invariably, unlike *A. nanus* (N. E. Br.) von Poellnitz grows socially in crevices and in the shade of rocks, with the long graceful inflorescences projecting well above their immediate rocky environment and so readily accessible to insect visitors. The plant is common on the hillsides, usually in the upper half of the western slopes near the crest, round the Fauresmith in the district, and, judging from the above, appears to be one of the few with a relatively wide distribution.

On the Fauresmith Reserve, the plant is very generally found among rocks under taller shrubs and bushes such as *Rhus Burchellii* Sond., * *Ehretia rigida* (Linn. f.) Druce, *Rhigozum obovatum* Burch., along with other such dwarf social succulents as *Kleinia radicans* (Thunb.) Haw. and *Haworthia tessellata* Haw. mixed with it, or in shady places not under other plants and associated with other succulents such as *Euphorbia aggregata* Berger, *Cotyledon toxicaria* C. A. Sm. (see p. 641), *Crassula obvallata* Linn. and *Mesembryanthemum saxicolum* † (L. Bolus) N. E. Br., *Stapelia flavirostris* N. E. Br. Marloth's fine coloured plate cited above agrees in all essential detail with a partly coloured plate made from the type specimen of which Fig. 4 is the rendering in monochrome.

27. *A. umbraticolus*, C. A. Sm. (Pls. IV, V.)

This species was first described in connection with toxicological experiments carried out at Onderstepoort (near Pretoria) by Dr. D. G. Steyn (see p. 615), and as the Journal containing the publication may not be readily accessible to other workers in the field of systematic botany, the description is given here in full:

Plant a succulent sometimes acaulescent perennial, glabrous in all parts, but covered on the leaves and inflorescence parts with a thin white waxy bloom. *Stem* (where present) stout and well-developed, up to 12 cm. high and 2 cm. thick, erect, simple or usually dichotomously branched in the upper half, terete, closely leafy toward and round the apices, with knobby excrescences marking the old leaf scars on the lower nude part, and covered

* *E. hottentotta*, Burch. of Thiselt.-Dyer, Fl. Cap. IV, 2.5 (1904).

† *Ruschia saxicola*, L. Bolus. The above determination was made for the writer by the late Dr. N. E. Brown at Kew from Dr. L. Bolus' type number, also collected by the writer on the Fauresmith Reserve.

with a thin greyish- or ashy- to yellowish-green skin. *Branches* resembling the stems, but thinner, up to 3 cm. long, simple or again shortly branched. *Leaves* alternate, occasionally pseudopposite at the apices of the branches, decussately arranged or somewhat scattered, oblong to obovate-cuneate, gradually narrowed from near, and toward, the base, usually rounded at the apex (or casually abruptly narrowed to a subacute, often in the younger stages, slightly crisped apex), up to 5 cm. long and 2 cm. wide, erect or ascending-erect, frequently (the lower) incurving-erect, very fleshy and up to 4 mm. thick in the middle near the base, gradually thinner towards the apical margin, green, often purple-red flushed at the apex, but never spotted, convex on the outer, and convex or flattened on the inner face in the upper half, convex on both surfaces in the lower half, and hence elliptic to oblong-elliptic in cross-section. *Inflorescence* apparently terminal or axillary, simple or with 2-3 branches, laxly racemosely-flowered in the upper half, nude, or with a few scattered and much reduced sterile scale-like bracts in the lower half; rachis rigidly erect or subcenuous near the apex, up to 35 cm. long, terete, brownish-purple. *Flowers* subsecund when open, and spreading, erect after fertilisation and in the bud stage. *Pedicels* up to 6 mm. long prior to, and 1 cm. long during the fruiting stage, most usually with 1-3 much-reduced lanceolate-ovate bracteoles, the lower occasionally with a sessile non-maturing flower from the upper bracteole, terete, and insensibly widening into the calyx, arising from the axils of much reduced ovate to ovate-lanceolate acute up to 1.5 mm. long bracts. *Calyx* purply-brown, fleshy: teeth ovate-deltoid, acuminate, up to 2.5 mm. long, fleshy and convex on the outer face and adpressed to the corolla. *Corolla-tube* cylindric, straight, obtusely 5-angled and marked with 5 evident sulci between the angles, up to 1 cm. long, purple to mauve-purple on the outer face deep mauve to maroon-coloured in the throat, scarlet to deep coral-red in the bud; lobes ovate-deltoid, acuminate, up to 2 mm. long, purple to mauve, thin and delicate; the limb at first spreading but at length reflexed. *Filaments* filiform, inserted as in the former species, purplish-mauve at the apex. *Anthers* ovoid, creamy-white or purple-flushed before dehiscence. *Ovaries* 4-5, oblong-ovoid, up to 5 mm. long, tapering into the subulate green styles. *Nectarial scales* oblong, up to 1.5 mm. long, very slightly notched at the apex, pale green.

A. umbraticolus, C. A. Sm., in Onderstepoort Journ. Vet. Sc. & An. Ind. Vol. I, 174 (1933).

Cotyledon trigyna Burt Davy, Fl. Transv. & Swaz. Vol. I, 142, 143 (1925), *pro majore parte, sed. excl. syn. et non-Tvl. exsicc. ; non Burch.* (1824).

TRANSVAAL HIGHVELD—Pretoria distr.: On the Magaliesberg at Silikaatsnek, in rocky crevices in shady places along the northern slopes, 5,000 ft., Nov. 1926, *Smith* 3432! (Pa); at Wonderboom, along rocky ledges and in crevices of precipitous sides of cliffs in the northern entrance to the Poort, 4,650 ft., Dec. 1925, *Smith* 1766! (Pa); On the farm "Witfontein", along upper half of northern slopes of the Magaliesberg, about 2 miles west of Wonderboom Poort, 4,600 ft., July 1933, *Smith* 6272! (Pa); at Pretoria, along northern slopes (upper half) of Meintjeskop range, below the crest near the old Fort in rocky crevices, 4,800 feet, Sept. 1925, *Smith* 693A! (Pa), and in rocky fissures and crevices in rich humus on the same range below the Reservoir, 4,800 ft., Nov. 1926, *Smith* 3456! (Pa), & *eod. loc.*, June 1931, *Smith & Ward* 3! (Pa). Witwatersrand distr.: Rocky crevices on a koppie at Braamfontein, near Johannesburg, 6,000 ft., Nov.-Dec. 1898, *Gillfillan* 60! (Pa).

A very common plant on the ranges round Pretoria and along the northern slopes of the Magaliesberg, invariably found growing socially (like the last species) in rocky crevices and fissures, with the vegetative parts in shade of other plants (Plate IV) and the rootsystem under rocks or often firmly wedged into the crevices, the inflorescence being exposed to the open where the flowers are more readily accessible to insect visitors. Fig. 5 shows a typical specimen:

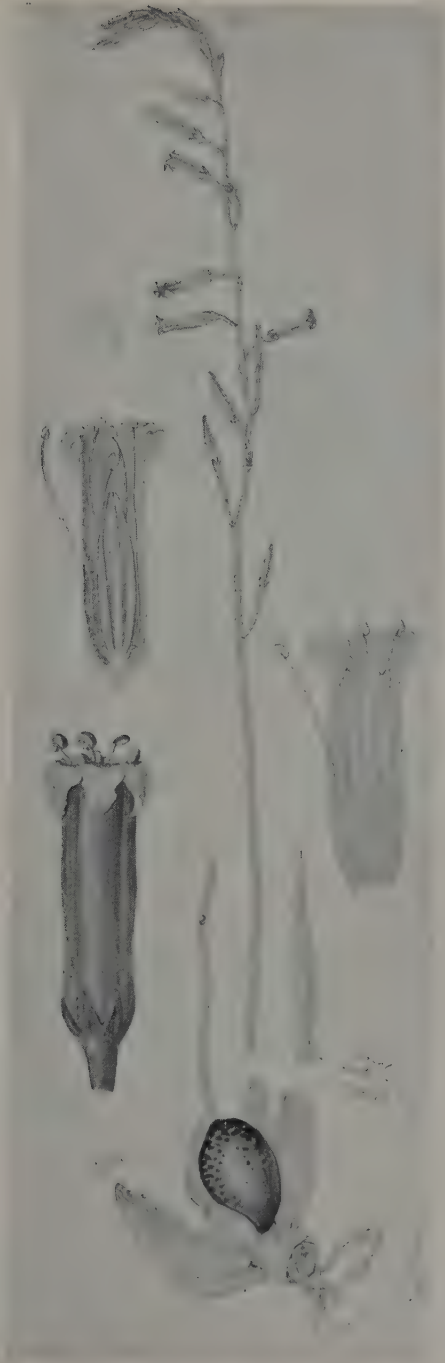


Fig. 4.—*A. rupicolus* C. A. Sm. Sketched from the living plant (the type) collected by the writer (Smith, 5603). See text.

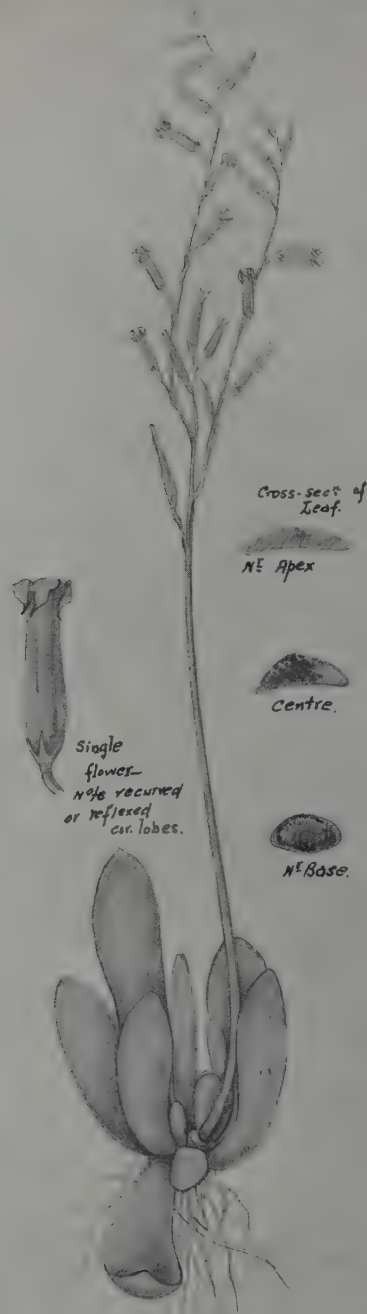


FIG. 5.—*A. umbraticolus*, C. A. Sm. Sketched from the living plant, the type. See text.

In the Meintjeskop localities the plants were found forming practically pure stands under dwarf arborescent specimens of *Strychnos pungens* Sol. (Plate IV), *Vangueria infausta* Burch., *Combretum Gueinzii* Sond., and very commonly also under tangled masses of *Landolphia capensis* Oliv., or in other cases associated with one or very generally more of the following: *Crassula argyrophylla* Diels (commonly so), *Euphorbia Schinzii* Pax, *Salacia Rehmannii* Schinz, *Kalanchoe paniculata* Harv., *Aloe Daryana* Schönl., *A. transvaalensis* O. Ktze., *Becium angustifolium* Benth., *Pachystigma Zeyheri* Sond., *Lannea edulis* (Sond.) Engl., *Leonotis microphylla* Skan and *Cotyledon leucophylla*, C.A. Sm. *Huernia Loesneriana* Schltr.

The accompanying photo (Plate IV), taken by the writer in Nov. 1926, shows *Smith 3456* growing under a specimen of *Strychnos pungens* Sol., with trailing branches of *Landolphia capensis* Oliv. (to the left and top right of the photo), the numerous erect peduncles with their long racemes forming an interlaced mass above the plants.

The next photo (Plate V) shows the plant in more open situations due to removal during the previous year or two of the sheltering *Landolphia capensis* Oliv. (seen to left and bottom right of photo) by nocturnal hunters for the notorious but legendary "Kruger millions" (note the hole in the centre).

This species is of interest in that the pedicels bear 1-3 bracteoles along the lower pedicels, from one of which (the upper) a sessile and generally abortive flower may arise, thus indicating an approach to the 3-florous condition seen in other species of the genus already noted (see p. 617), though in the former the pedicelled condition prevails, and it is a feature of further interest to note that the bracteoles with barren flowers were seen only in cultivated specimens thus far.

The leaves of this species also behave like those of *A. Mariana* (Marl.), i.e. when they drop or are broken off from the parent plant desiccation does not follow immediately, but adventitious roots are developed at the base, followed in time by tufts of leaves, the genesis of one or more new plants. Both the two leaves seen in the foreground in Plate V had started to root in this manner, the one on the right having also produced new leaves.

28. *A. saxicolus*, C. A. Sm.,

Planta nana, succulenta, perennis, in partibus omnibus glabra, locis apricosis crescens. *Radix* plerumque multus incrassatus et succulentus, ad 2 cm. diam., basi nodulis rotundatis. *Caules* e corona radiceis 1-3 (vel plus), breves (ad 2.5 cm. alti), crassi (ad 1 cm. diam.), ad apices dense foliosi, vel caules 0, foliis tum circum coronam rotundatam aggregatis. *Folia* dispersa, vel summa pseudopposita, dense congesta et subrosulata, lineari-oblonga ad oblongo-elliptica, plus minusve ad basin et apicem auctum equaliter angustata, ad 3.5 cm. longa et 1 cm. lata, carnosissima et ad 5 mm. in medio crassa, superne inferneque convexa, viridia, immaculata, pallide rosea in superiore parte. *Inflorescentia* simplex: rhachis rigide erectus, ad 25 cm. longus, simplex. *Flores* pedicellati, in cymulis 1-floris dispositi, post anthesin patentes et subsecundi, postquam impregnationem ovariorum erecti. *Pedicelli* ad 5 mm. longi, vel 7 mm. in fructu, teretes, saepe bracteola membranacea subulata onusti. *Calyx* cinereo-viridis, carnosus: dentes lanceolato-deltoides, acuminati, ad 1.5 mm. longi. *Tubus corollae* cylindricus, rectus, obtuse 5-angulatus, ad 8 mm. longus, purpurascens, in fauce purpureus vel saturate ruber: lobi ovato-deltoides, acuminati, ad 1.5 mm. longi, purpurei, sed pallidioribus marginibus, deinde reflexi. *Filamenta* filiformia, ut more sectionis in tubo corollae inserta, ad apices purpurea, infra viridescenti-lutea. *Antherae* ovoideae, post anthesin lutescentes vel purpureae. *Ovaria* 5, oblongo-ovoides, ad 5 mm. longa, in stylo viride subulata angustate. *Squamae nectarii* oblongo-cuneatae, ad 1 mm. longae, apice breviter emarginatae, pallido-virides.

TRANSVAAL HIGHVELD—Pretoria distr.: At the southern entrance to Baviaanspoort, on the Magaliesberg, growing socially on rocky ledges and in crevices filled with black humus, 4,500 ft., Nov. 1926, *Smith* 3424! Syntype (Pa): at Premier Mine, in open places on a koppie to east of the mine, growing in rocky depressions and crevices, June 1931, *Smith & Ward* 5! Type (Pa).

The plant is closely related to the previous species, but from this it is readily known by its rootstock, the acute leaves (only very casually obtuse), as well as by their shape, and its consistently dwarf habit. Found only in one locality at the Premier Mine associated with *Crassula argyrophylla* Diels, *Euphorbia truncata* N. E. Br., *E. Schinzii* Pax, *Lopholacna coriifolia* (Sond.) Phill. & C. A. Sm., *Selaginella rupestris* Spreng., *Parinari capense* Harv., and the very dwarf forms of *Burkea africana* Hook.

SPECIES EXCLUSA.

The *Cotyledon* described by Haworth (Misc. Nat. 180: 1903) as *C. caespitosa* Haw. with "Habitat ad Cap. Bon. Sp." is not a Cape plant at all, but, as later corrected by Haworth himself (Syn. Suppl. Succ. Ed. Germ. 117: 1819), is a Californian plant, said to be conspecific with *C. linguiformis* (Ait. Hort. Kew. Ed. 2. Vol. 3, 109: 1812), which was obtained from California (see Saund., Ref. Bot. I. t. 69: 1869). It belongs to a genus now excluded from *Cotyledon* Linn. (emend.).

BIBLIOGRAPHY.

- (¹) Engler and Prantl, Nat. Pflanzenfam, Vol. 18. (1930.)
- (²) Harvey and Sonder, Flora Capensis, Vol. 2 (1861-62).
- (³) Records of the Albany Museum, Vol. III (1915).
- (⁴) Journal of Botany, Vol. 40 (1902).



Plate I.—*A leucothrix* C.A. Sm. Type plant.

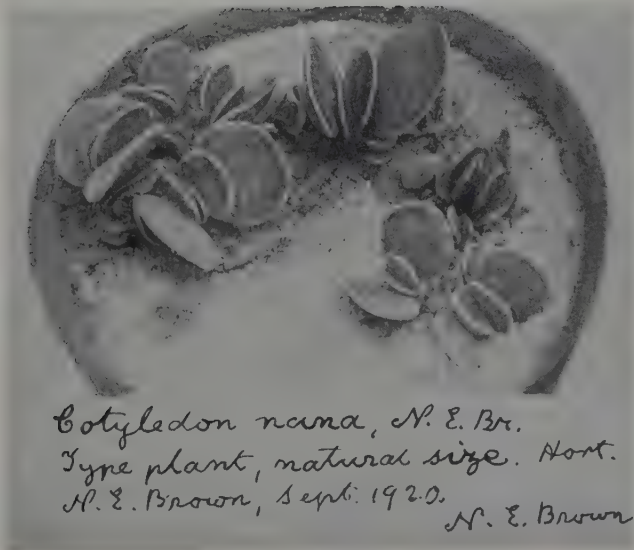


Plate II.—*A. nanus* (N. E. Br.) von Poellnitz Type plant photographed by Miss. Brown, Sept., 1920 (see text).



Plate III.—*A. nanus* (N.E. Br.) von Poell., photographed in its native habitat with a group of associated succulents by the writer in April, 1927. (See text.)



Plate IV.—*A. umbraticolus* C.A. Sm., in its natural habitat. (See text.)



Plate V.—*A. umbraticolus* C.A. Sm., with associated plants. Photo taken by the writer (Nov., 1926), slightly to the right of the one shown in plate IV. (See text.)

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